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HUMAN FACTORS ENGINEERING
SYSTEM ANALYSIS OF SEA KING DECK LANDING

FINAL PROJECT REPORT

15 October 2001

Contract Serial Number W7711-007686/A

Prepared by

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EXECUTIVE SUMMARY

The Defence and Civil Institute of Environmental Medicine (DCIEM) is exploring various means of providing low-cost, effective training for helicopter aircrew through simulation and virtual environments. Frequently, training requires participation by several individuals; however, coordinating schedules is often difficult. Virtual agents that behave realistically are required to reduce costs and increase opportunities for training.

As part of the ongoing evolution of the process and tools, DCIEM has developed a method for applying the Perceptual Control Theory (PCT) to HFE conceptual-phase analyses. This approach is based on the concept that a hierarchy of goals and control feedback loops can describe both humans and machines. A study completed by BAE SYSTEMS CANADA INC. (BSC) in March 2000 [Reference 2] showed that the PCT approach was applicable to HFE conceptual-phase analyses and offered some benefits over the traditional MIL-HDBK-46855 approach. Based on the findings of this study, DCIEM is proceeding with the further development of PCT elements within the Integrated Performance Modelling Environment (IPME).

This effort created a model of Sea King helicopter crew behaviour within IPME using a PCT-based analysis. As part of the model development, gross and critical goal analyses, and an information flow and cognitive processing analysis were conducted. Additionally, traditional OSDs, developed using the SOLE toolset, were prepared. To support DCIEM's effort to integrate IPME with anthropometric analysis tools such as Safework™, data describing the physical elements of pilot goals, e.g. control actuation or general body movement, was captured and incorporated into the model.

The results of this analysis illustrate that IPME can be effectively used to conduct a PCT analysis of an operational domain. Additionally, this project demonstrated that the data necessary to animate anthropometric mannequins could be incorporated into a network model, with the potential to be linked to other HFE analysis simulations such as Safework™. Unfortunately, the present state of the HFE toolsets requires that the same data be handled multiple times, e.g. network models were generated in Visio and SOLE to allow SME review but were then manually recreated within IPME to allow network simulation. It is recommended that the evolution of IPME and other HFE tools be supported to yield one integrated tool.

It is anticipated that the IPME model will be used in the future development of a pilot-agent that can be used in distributed network simulation as a deck landing and take-off training aid for other crewmembers. Eventually, a pilot model that can interact with other networked models, virtual agents, and human participants in distributed simulations (most likely through HLA) will be developed.

SOMMAIRE

L'Institut de médecine environnementale pour la défense (IMED) est à explorer différents moyens de fournir aux équipages d'hélicoptères un entraînement efficace, à peu de frais, grâce à des environnements virtuels et de simulation. D'habitude, l'entraînement requiert la participation de plusieurs personnes. Or, il est souvent difficile de coordonner les échéanciers. On a donc besoin d'agents virtuels qui se comportent de manière réelle pour réduire le coût et accroître les possibilités d'entraînement. Le travail dont il est question avait pour but d'explorer l'application de l'analyse ergonomique à un modèle et de faire figurer le comportement d'un équipage de l'hélicoptère Sea King dans la Modélisation intégrée de performance dans l'environnement, un logiciel qui modélise l'environnement et qui est en train d'être élaboré pour appuyer l'acquisition fondée sur la simulation.

Dans le cadre de l'évolution permanente du processus et des outils, l'IMED a élaboré une méthode qui consiste à appliquer la théorie de commande de la perception (TCP) aux analyses ergonomiques effectuées à la phase de conception. Cette approche repose sur le concept selon lequel une hiérarchie de buts et de boucles de rétroaction de commande décrivent à la fois les humains et les machines. Une étude menée en mars 2000 par l'entreprise BAIE SYSTEMS CANADA INC. (BSC) a montré qu'on pouvait appliquer la TCP aux analyses ergonomiques effectuées durant la phase de conception et qu'elle offrait quelques avantages de plus que la traditionnelle approche MIL-HDBK-46855.

On s'est servi d'une analyse fondée sur la TCP pour recueillir des données sur le comportement de l'équipage technique d'un hélicoptère Sea King lors d'un appontage. Plusieurs analyses ergonomiques essentielles étaient accomplies en vue de l'élaboration du modèle, soit des analyses sommaires et critiques, une analyse du flux de l'information et une analyse du traitement cognitif. L'IMED est à intégrer l'IPME dans l'analyse anthropométrique et dans les outils de visualisation tels que le SafeworkTM. Pour soutenir cet effort de l'IMED, on a intégré dans le modèle les données décrivant les activités physiques nécessaires à la réalisation des buts visés par l'appontage.

Les résultats de cette analyse montrent qu'on peut utiliser efficacement l'IPME pour faire une analyse basée sur la TCP d'un domaine opérationnel. De plus, ce projet a démontré que les données nécessaires à l'animation des mannequins anthropométriques pouvaient être intégrées dans un modèle de réseau, avec la possibilité de les rattacher aux autres outils d'analyse ergonomiques comme le SafeworkTM. La prochaine étape consistera à créer une représentation virtuelle à l'aide des capacités d'animation du SafeworkTM, quand on aura mis au point une interface convenable. On prévoit que le modèle IPME servira à la création d'un agent-pilote qui pourra contribuer à la simulation d'un réseau réparti. Cet agent-pilote pourra en effet favoriser l'apprentissage de l'appontage et du décollage visant d'autres membres de l'équipage, par exemple, l'officier chargé de la sécurité de l'appontage. Ce genre de modèle pilote interagirait avec d'autres modèles du réseau, d'autres agents virtuels et d'autres humains participant aux simulations réparties. Ce travail contribuera à cerner les besoins de modélisation et de simulation qui mettront à la disposition des Forces canadiennes des appareils d'apprentissage d'équipes peu coûteux, en particulier les appareils qui exigent une représentation du comportement humain dans les forces produites par ordinateur.

La méthode suivie dans cet exercice de modélisation a exigé la manipulation à des données à maintes reprises, par exemple, les modèles de réseau étaient générés en Visio et en SOLE pour être examinés par des experts en la matière; or, ils ont été récréés manuellement dans l'IPME afin de permettre la simulation de réseaux, ce qui limite l'état du développement actuel de l'ensemble d'outils ergonomiques IPME, ensemble qui doit être intégré afin que les données soient entrées une fois et mises à la disposition des autres outils.

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SECTION ONE – INTRODUCTION

1.1 BACKGROUND

The Defence and Civil Institute of Environmental Medicine (**DCIEM**) is exploring various means of providing low-cost, effective training for helicopter aircrew through simulation and virtual environments. Frequently, training requires participation by several individuals; however, coordinating schedules is often difficult. Virtual agents that behave realistically are required to reduce costs and increase opportunities for training.

In 1985, DCIEM initiated the development of processes and tools for conducting human factors engineering (**HFE**) analyses in support of equipment procurements for the Department of National Defence (**DND**) and its allies. This included a process and toolset for conducting conceptual-phase analyses in accordance with the requirements of MIL-HDBK-46855A Human Engineering Requirements for Military Systems, Equipment, and Facilities [Reference 1].

As part of the ongoing evolution of the process and tools, DCIEM has developed a method for applying the Perceptual Control Theory (**PCT**) to HFE conceptual-phase analyses. This approach is based on the concept that a hierarchy of goals and control feedback loops can describe both humans and machines. A study completed by BAE SYSTEMS CANADA INC. (**BSC**) in March 2000 [Reference 2] showed that the PCT approach was applicable to HFE conceptual-phase analyses and offered some benefits over the traditional MIL-HDBK-46855 approach. Based on the findings of this study, DCIEM is proceeding with the further development of PCT elements within the Integrated Performance Modelling Environment (**IPME**).

The intent of this effort was to create a model of Sea King helicopter crew behaviour, to be used in the future development of a pilot-agent that can be used in distributed network simulation as a deck landing and take-off training aid for other crewmembers. Eventually, a pilot model that can interact with other networked models, virtual agents, and human participants in distributed simulations (most likely through high-level architecture (**HLA**)) will be developed. DCIEM is currently investigating the requirements for integrating network analysis tools such as IPME and related anthropometric analysis tools such as Safework™. To support this effort, this tasking also generate data capturing the physical characteristics of the pilot operations (including control actuation and manipulation, and general body movement), which may be used to stimulate an anthropometric model within another application.

1.2 AIM

The aim of this report is to document the methodology and results of a PCT-based human engineering systems analysis and the development of a network model.

1.3 OBJECTIVES

In order to accomplish the goals of the current tasking, the following specific objectives were identified:

a. conduct a mission analysis to determine operational needs, objectives and constraints of Sea King deck landings. Data collection exercises, coupled with discussions between in-house domain experts and HFE personnel, culminated in three composite scenarios based on the outline provided in the Statement of Work (**SOW**) [Reference 3];

b. decompose the day freedeck composite mission scenario to the fourth level. Graphical representations of the hierarchical goal decomposition will be established for each of these levels;

c. conduct a detailed goal analysis for each (unique) fourth-level goal identified in the decomposition process;

d. conduct a critical goal analysis for any goal identified as being critical in nature (in accordance with traditional MIL-HDBK-46855 guidelines);

e. develop a traditional set of operational sequence diagrams (**OSDs**) to facilitate an information flow and cognitive processing analysis of Sea King deck landing operations; and

f. develop an IPME network model, including scenario events and variables for data collection, and execute the baseline model to ensure it will run in accordance with the constructs established by the Technical and Scientific Authority.

1.4 SCOPE

The analyses conducted during this project focused on daytime freedeck landings including emergencies, as described in the SOW [Reference 3]. Only goals achieved by the flying and non-flying pilots were examined.

1.5 REPORT CONTENTS

The report consists of the following sections:

a. **Section One—Introduction.** Section One provides background information, the aim of the report, the objectives and scope of the analysis, and a report outline.

b. **Section Two—Analysis Methodology.** Section Two provides the details of the methodology used to conduct the analysis.

c. **Section Three—Mission Analysis.** Section Three presents the results of the mission analysis.

d. **Section Four—Hierarchical Decomposition.** Section Four outlines the results of the hierarchical decomposition.

e. **Section Five—Goal Analysis.** Section Five describes the detailed and critical goal analysis results.

f. **Section Six—Information and Cognitive Processing Analysis.** Section Six presents the information flow and processing analysis results.

g. **Section Seven—Develop IPME Network Model.** Section Seven describes the results of the network model development.

h. **Section Eight—Concluding Material.** Section Eight provides conclusions and recommendations.

i. **Section Nine—References.** A list of references is provided in Section Nine

j. **Annexes:** This report includes the following annexes:

(1) Annex A—Glossary of Terms and Acronyms,
(2) Annex B—Composite Mission Scenarios,
(3) Annex C—Hierarchical Decomposition,
(4) Annex D—Inventory of Goals,
(5) Annex E—Detailed Goal Analysis,
(6) Annex F—Critical Goal Analysis,
(7) Annex G—OSDs, and
(8) Annex H—Information Flow and Cognitive Processing Analysis.

SECTION TWO – METHODOLOGY

2.1 INTRODUCTION

Section Two provides a description of the methodologies used for the human engineering analysis of Sea King deck landings. This analysis utilized the methodology described in MIL-HDBK-46855A [Reference 1] adapted to follow PCT constructs.

The remainder of this section describes the application of the PCT analysis methodology to the following elements of the deck landings analysis:

a. mission analysis – methodology;
b. hierarchical decomposition – methodology;
c. goal analysis – methodology;
d. information flow and processing analysis – methodology; and
e. development of IPME model - methodology.

2.2 MISSION ANALYSIS – METHODOLOGY

This mission analysis documents the operational needs, objectives, and constraints of Sea King deck landing missions. The mission analysis involves reviewing and documenting the operational concept, and describing the current or proposed missions of the aircraft. The mission analysis culminates in the preparation of a composite mission scenario.

The experience of the Mission Specialist was one of the prime sources of information for the mission analysis. In addition, publications such as Standard Operating Procedures (**SOP**s), checklists, tactical planning documents, and other documents used by operational personnel during training and operations were reviewed in the conduct of the mission analysis.

2.2.1 Composite Mission Scenario

Composite mission scenarios, in narrative form, were developed to provide a framework for the evaluation of the goals of the Sea King crew during deck landings. The composite scenarios comprise a representative number of events, consisting of a collage of mission segments, containing high but realistic workload demands on the pilot. The scenarios were built on the scenario outline provided in the SOW [Reference 3]. This approach, which is common for HFE analyses of complex systems, is intended to minimize the cost of the analyses by focusing effort on critical mission activities, and eliminating as much as possible the low workload and repetitious mission segments which provide little added value.

Scenarios are developed from the assumed threat, concept of operations, and the baseline mission profiles. They are written in a straightforward narrative format describing the proposed mission in detail, identifying key events and implied requirements. Each paragraph of the narrative describes short segments of a mission.

Elements of the scenarios are sufficiently detailed to convey an understanding of the aircraft's mission, and permit a breakout of mission variations relating to features such as mission phases, activities performed in each phase, time, and any interdependencies of activities relating to sequence, coordination, and information transfer. The length of the composite scenario is directly related to the subsequent analytical effort associated with the study. If the scenario is too short, an insufficient number of high workload segments will be analyzed. On the other hand, if the composite scenario is too long, the study will not be completed in sufficient depth to be useful. The composite scenario should condense as many activities into the time allocated as possible.

2.2.2 Identify Potential Measures of Effectiveness

This effort was conducted within the structure of a working group comprised of BSC personnel, Technical and Scientific Authority, and the in-house Sea King Domain Expert These measures of effectiveness (**MOE**s) were defined in accordance with the constraints of the modelling environment (that is, IPME). The MOEs associated with traditional Systems Operator Loading Evaluation (**SOLE**) analyses were used as the starting point for these discussions, and were augmented by the type of data available within IPME and the nature of operations within the Sea King deck landing sequence.

2.3 HIERARCHICAL DECOMPOSITION – METHODOLOGY

Within the methodology prescribed by MIL-HDBK-46855A [Reference 1], functional analysis is the procedure by which the missions are successively subdivided into smaller component parts. The network, which links these functional groups, indicates the flow of execution of the associated actions. The completion of this decomposition results in the compilation of all goals which would be performed by the pilot and co-pilot during the conduct of the mission.

The decomposition uses a combination of narrative and graphical data to describe Sea King deck landing activities as distinct sections, each with its own discrete hierarchy of goals, but related to each other in a logical and chronological sequence. The methodology to accomplish this result involves a functional decomposition of the missions from top-level functions and goals down to fourth-level functions and goals. The functional decomposition utilizes the results of the mission analysis, and provides the basis for the subsequent goal analysis and network model development.

For Sea King deck landings, the hierarchical decomposition involved decomposing the missions throughout five successively lower levels from the "top" down to the "fourth" levels. In a traditional analysis, virtually all of the subsequent analyses are conducted at the fourth or "task" level, and as such, the primary objective is to get down to the fourth level to complete the remainder of the analysis. However, with the implementation of a goal-based, hierarchical decomposition process and the governing tenets of PCT, the successive decomposition yields both functions and goals at each functional level. These intermediate goals represent the control or supervisory activities associated with each sub-function. Subsequent analysis now must be completed for all goals, no matter what level they exist at within the decomposition. For each goal and fourth-level function, data including an identification number, a label, and a description are collected during the hierarchical decomposition.

Top-, first-, and second-level functions were defined for all Sea King deck landing activities. Third- and fourth-level functions were identified for all second-level functions related to free deck landings, including emergency procedures. Each of the functional levels acts as a framework for subsequent levels. The final level of the successive decomposition is the fourth level.

The hierarchical decomposition yielded an inventory of functions containing a listing of all top-, first- and second-, third, and fourth-level functions and goals. These are listed in a functionally decomposed order; that is, following each top-level function, all related first-level functions are listed, and between the first-level functions, all the second-level functions associated with the first-level function are listed.

2.3.1 Graphical Representation of Hierarchical Decomposition

The methodology includes developing graphical representations for all top-, first-, and second-levels of the decomposition. The graphical representations illustrate the logical and chronological relationships between the various mission functions. Generally, graphical depictions of the third level of the decomposition are not prepared because of the increasing number and complexity of the functions and goals at that level. Fourth-level functions or goals are represented in OSDs, as discussed in Subsection 2.4.5.1.

The graphical presentation of this data is particularly useful for reviewing the results of the mission decomposition with SMEs. Using graphical representations of the network functions makes them easy to understand and to associate with the operational environment.

2.4 GOAL ANALYSIS – METHODOLOGY

2.4.1 General

The primary objective of a goal analysis is to develop a database of goal-related information to support the analysis of the existing system and to establish a baseline for developing requirements for a replacement system. Additionally, as DCIEM envisages, the data collected during a goal analysis could be used to develop software models and intelligent agents.

2.4.2 Detailed Goal Analysis

Using the goal inventory and descriptions for the hierarchical decomposition, BSC completed a detailed analysis of all goals to develop the information specified in the SOW [Reference 3]. The analysis was based on the capabilities of the Sea King and current SOPs.

The following information was developed for each goal, with references included for the quantitative analysis methodologies as applicable:

a. **Initiating Conditions**—a narrative description of the conditions that would cause the goal to be attended;

b. **Initiating Actions**—a narrative description of the actions to be taken in attending to the goal;

c. **Ending Conditions**—a narrative description of the conditions that would cause attendance of the goal to be terminate (that is, the goal has been achieved);

d. **Ending Actions**—a narrative description of the actions to be taken when the goal has been achieved;

e. **Declarative Knowledge Requirements**—narrative descriptions of the general knowledge, e.g. facts, the meaning of symbols, or standard operating procedures, required to achieve the goal;

f. **Situational Knowledge Requirements**—narrative descriptions of the mission specific knowledge required to achieve the goal;

g. **Output and Behaviours**—an assignment of the human behaviours, and related cognitive perceptual process categories, for goal attendance (see Table 2-1);

h. **Input and Sensation**—an assignment of the input sensations, and related cognitive and perceptual process categories, for assessing goal achievement (see Table 2-2);

i. **Influenced Variables (External)**—a listing of the external variables within the control loop that the operator affects while attending to the goal (external variables are observable by a third party);

j. **Local and Global External Variable**—for each external variable, indicates if the external variable is only influenced by one operator (local) or can be influenced by many operators (global);

k. **Output Interface**—a listing of the interfaces the operator uses to interact with the external world;

l **Influenced Variables (Internal)**—a description of the operator's perception as to whether the goal has been achieved or not (internal variables are not observable by a third party);

m. **Input Interface**—a listing of the interfaces which influence the operator's perception as to whether or not the goal has been achieved;

Table 2-1 Output and Behaviour Characteristics

Output and Behaviour	Cognitive and Perceptual Process Category [Reference 4, Table 4]
Voice:	
1 Voice	3. Speech production
Psychomotor:	
1 Manual Output	
1.1 Simple	1 Automatized, highly learned
1.2 Difficult but familiar	4. Spatial encoding
1.3 Complex or unfamiliar	5. Memorization and recall, calculation, estimation, deduction, reasoning
Memory:	
1 Commit to memory (LTM or STM)	5. Memorization

Table 2-2 Input and Sensation Characteristics

Input and Sensation	Cognitive and Perceptual Process Category [Reference 4, Table 4]
Vision:	
1 Central:	
1.1 Text, dial reading	3. Verbal encoding
1.2 Pattern, spatial relationship, tracking, graphic displays	4. Spatial encoding, visual pattern recognition
2 Peripheral	1. Automatized, highly learned
Audition:	
1 Tone or simple auditory signal	1. Automatized, highly learned
2 Speech input (*incidental to primary task*)	2. Passive (pre-attentive) monitoring of audio signals
3 Auditory pattern	3. Verbal decoding
4 Auditory localization	4. Spatial encoding
5 Speech input (*attended to, salient to primary task*)	3. Verbal decoding, speech recognition
Kinaesthetic:	
1 Tactile:	
1.1 Simple stimulus	1. Automatized, highly learned perception
1.2 Complex stimulus	4. Spatial encoding
Memory:	
2 Recall from memory:	
2.1 Accessible, familiar	1. Automatized
2.2 Verbally coded	3. Verbal decoding
2.3 Spatially coded	3. Spatial decoding
2.4 Semantically coded	3. Verbal decoding
2.5 Complex operation	5. Recall

n. **Goal Criticality Rating (GCR), Adjusted GCR (AGCR), and Rationale** - an indicator and rationale of the criticality of the goal as required for the performance predictions, and to identify those goals that warrant a more detailed analysis during a subsequent analysis phase (Subsection 2.4.4);

o. **Visual, Auditory, Cognitive, Psychomotor (VACP) Ratings**—attentional demand ratings in each of the four modalities as an indicator of the demands imposed on the human during the performance of the task (see Table 2-3);

p. **Probabilistic Goal Completion Times** – estimates of the time required for the operator to successfully achieve the goal. Note: the completion time may be expressed as a traditional probabilistic distribution (normal, triangular, etc) or a function to be calculated prior to goal initiation;

q. **Feedback to Higher-Level Goals?** - a "yes" or "no" indication of whether the achievement of the goal influences one or more higher-level goals. The HGA process has adopted the assumption that if feedback is provided to a higher-level goal, the goal to which feedback is provided is the parent to the goal being analyzed (ie. there is a direct PARENT – CHILD relationship associated with this feedback element). Any feedback relationship other than this default must be identified.

r. **SAFEWORK Data Elements:** to facilitate a link to the anthropometric modelling environment, data elements were provided for each lower level goal to enable the manipulation of a mannequin within the SAFEWORK application. The data required defined the following aspects of the goal:

   1) **Body Part**—a narrative description of the body part(s), for example, left foot or right index finger, used in achieving each goal;

   2) **Target**—a narrative description of interface elements in the cockpit, for example, cyclic or pedals, that are manipulated by each body part in achievement of the goal; and

   3) **Action**—a narrative description of the manipulation of a target required to achieve the goal.

2.4.3 Critical Goal Analysis

During the detailed goal analysis, an analysis was conducted to identify those tasks deemed to be critical in accordance with specific criteria. The objective of this analysis is to identify all goals considered to be sufficiently critical to warrant additional analysis. This involves assigning a GCR to each task by considering the degree to which non-achievement of the goal would affect the following goal criticality criteria (**GCC**): safety, mission effectiveness, efficiency, system reliability, and cost. An AGCR was also identified by considering two additional factors: the degree to which task completion may by limited by human capabilities, and the potential ease with which the task may be improved (such as by changing procedures or modifying software). The primary reason for using an AGCR is to increase the number of goals to be analyzed during the critical goal analysis, thereby minimizing the possibility of missing a goal that could prove to be critical to system performance. The GCR may also be used during performance prediction analyses to determine which tasks may be shed, queued, or interrupted when a goal conflict occurs.

Table 2-3 Attentional Demand Ratings [Reference 5]

Ordinal Rating	Interval Rating	Descriptors
Visual Modality - Unaided (Naked Eye)		
1	1.0	Register/Detect (Detect Occurrence of Image)
2	1.4	Read (Symbol)
3	2.5	Scan/Search/Monitor (Continuous/Serial Inspection, Multiple Conditions)
4	4.6	Inspect/Check (Discrete Inspection/Static Condition)
5	5.2	Discriminate (Detect Visual Difference)
6	5.5	Track/Follow (Maintain Orientation)
7	7.0	Locate/Align (Selective Orientation)
Auditory Modality		
1	1.0	Detect/Register Sound (Detect Occurrence of Sound)
2	1.2	Verify Auditory Feedback (Detect Occurrence of Anticipated Sound)
3	4.4	Orient to Sound (General Orientation/Attention)
4	4.8	Interpret Semantic Content (Speech)
5	5.0	Orient to Sound (Selective Orientation/Attention)
6	6.5	Discriminate Sound Characteristics (Detect Auditory Differences)
7	7.0	Interpret Sound Patterns (Pulse Rates, etc.)
Cognitive Modality		
1	1.0	Automatic (Simple Association)
2	1.2	Sign/Signal Recognition
3	2.0	Alternative Selection
4	4.1	Estimation, Calculation, Conversion
5	4.6	Evaluation/Judgement (Consider single Aspect)
6	5.1	Encoding/Decoding, Recall
7	7.0	Evaluation/Judgement (Consider Several Aspects)
Psychomotor Modality		
1	1.0	Speech
2	1.3	Discrete Actuation (Button, Toggle, Trigger)
3	2.6	Manipulative
4	3.1	Discrete Adjustive (Rotary, Vertical Thumbwheel, Lever Position)
5	3.8	Continuous Adjustive (Flight Control, Sensor Control)
6	4.7	Serial Discrete Manipulation (Keyboard Entries)
7	7.0	Symbolic Production (Writing)

The following additional data were collected for each critical goal:

a. **information available** - a listing of the available and required information necessary for successful goal achievement by the crew member;

b. **evaluation process** - assigns one or more of the following cognitive process descriptors to describe the primary cognitive process performed by the operator during goal achievement: calculation, encoding, decoding, comparison with respect to previous information, and comparison with respect to proven techniques;

c. **decision reached after evaluation process** - a listing of any decisions which the operator may be required to make during goal achievement;

d. **body movements required by action taken** - itemizes any movements which are typically executed by the operator during task performance as well as identifying any relevant equipment that is used;

e. **workspace envelope required by action taken** - describes the workspace required for each goal;

f. **workspace envelope available** - describes the current state of Sea King workspace available for each task. Comparing the results of this item with the "Workspace Required" column will reveal deficiencies in the Sea King workspace envelope ;

g. **location and condition of work environment** - category provides a listing of the workstation(s) normally associated with goal achievement;

h. **frequency of action** - where applicable, the frequency (estimated as number of occurrences per mission) in which the goal is performed;

i. **accuracy of action** - lists the degree of accuracy with which the task must be performed, as one of "high, "medium," or "low," with an accompanying rationale;

j. **tools and equipment required** - lists any tools and equipment which the operator is normally required to use to complete the task, not including software or aircraft avionics hardware;

k. **specialty, experience, and number of personnel required** - lists the designation of the crewmembers required to achieve the goal;

l. **job aids or references required** - includes any non-software references, such as checklists, that are normally used by the operator to complete the task;

m. **communications required (including type)** - listing of the communications required by the operator for task performance.;

n. **special hazards involved** - lists any potential hazards to the operator, the crew, the aircraft, other aircraft or friendly surface units;

o. **operator interaction** - lists any non-verbal communication conducted between crewmembers required for task completion;

p. **operational limits of personnel** - category lists the degree to which goal achievement potentially exceeds the capabilities of the operators, as one of "within", "approaching", or "exceeded"; and

q. **operational limits of machine and software** - category lists the degree to which goal achievement potentially exceeds the capabilities of the machine, as one of "within", "approaching", or "exceeded."

2.4.4 Methodology for Assessing Goal Criticality

In order to determine the GCR and AGCR, the analyst performs a three-step process schematically illustrated in Figure 2-1. The key elements of this process include:

a. conducting a subjective assessment of the criticality of each goal with respect to the five criteria;

b. integrating the goal criticality information using a GCR flowchart; and

c. incorporating an adjustment factor to compensate for the degree to which goal achievement may be limited by critical human performance, and the relative ease with which this goal may be improved (this adjustment converts the GCR to an "adjusted" GCR).

In assessing the criticality of each task against the five GCCs, the analyst uses the following methodology:

a. **Safety.** A value from 1 to 10 is assigned according to the degree to which the non-achievement of a given goal would adversely affect the safety and survivability of mission participants (such as, tactical formation and lateral mission elements). For example, failure to monitor and avoid obstacles would warrant a rating of 9 or 10.

b. **Mission Effectiveness.** A value from 1 to 10 is assigned according to the degree to which the non-achievement of a given goal would jeopardize or limit the successful completion of the mission. For example, failure to achieve a radar lock-on could cause the mission to fail and warrant a rating of 9 or 10.

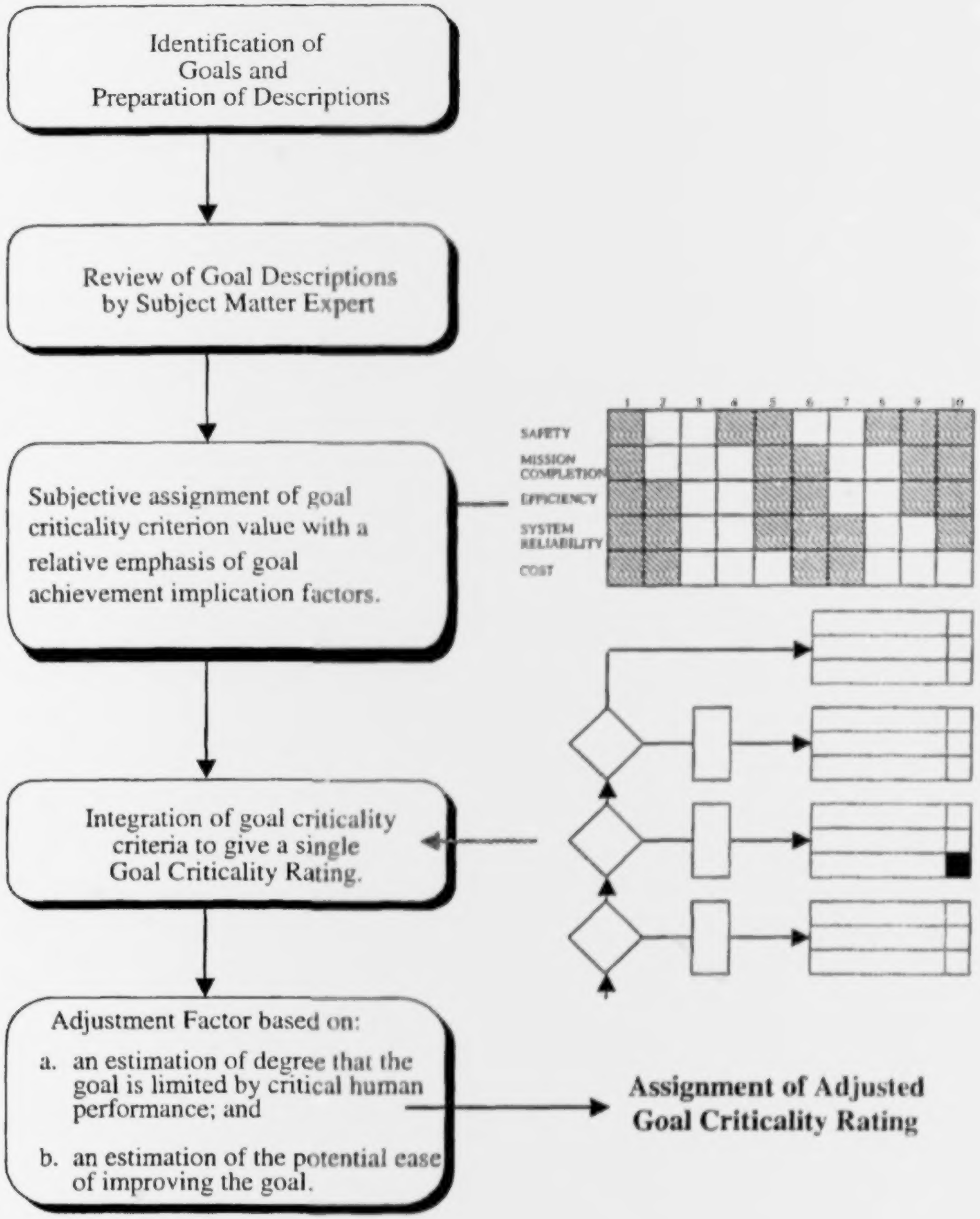

Identification of Goals and Preparation of Descriptions
Review of Goal Descriptions by Subject Matter Expert
Subjective assignment of goal criticality criterion value with a relative emphasis of goal achievement implication factors.
1
2
3
4
5
6
7
8
9
10
SAFETY
MISSION COMPLETION
EFFICIENCY
SYSTEM RELIABILITY
COST
Integration of goal criticality criteria to give a single Goal Criticality Rating.
Adjustment Factor based on:
a. an estimation of degree that the goal is limited by critical human performance; and
b. an estimation of the potential ease of improving the goal.
Assignment of Adjusted Goal Criticality Rating

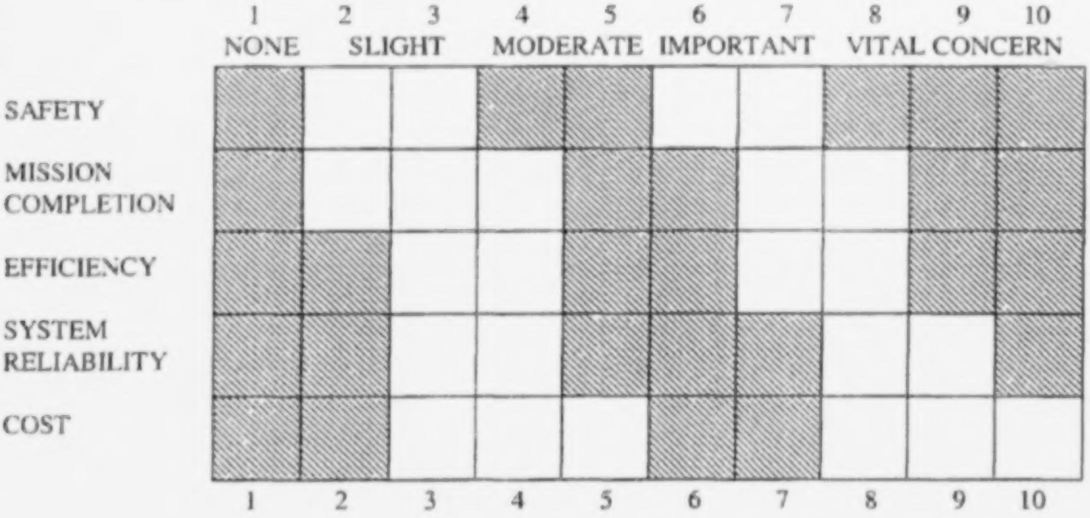
Figure 2-1 Assignment of Goal Criticality Rating

c. **Efficiency.** A value from 1 to 10 is assigned according to the degree to which the non-achievement of a given goal would reduce human efficiency by requiring corrective action by the aircrew. For example, an error in updating link 16 information causes the aircrew to re-enter the correct information and warrant a rating of 7 or 8.

d. **System Reliability.** A value from 1 to 10 is assigned according to the degree that non-achievement of a goal would adversely affect the long-term or short-term reliability of the system. Task combinations influencing this factor would decrease the mean time between failure or render the system unserviceable for the remainder of the mission.

e. **Cost.** A value from 1 to 10 is assigned according to the degree to which the non-achievement of a given goal would result in increased monetary cost. For example, failure to monitor and avoid terrain could result in the loss of an aircraft and therefore warrant a rating of 6 or 7.

The numerical values for each GCC are then plotted on the GCC Assessment Chart provided as Figure 2-2. This chart permits the identification of the relative concern for each of the evaluation parameters (None, Slight, Moderate, Important, or Vital Concern) by observing the location of the assigned value with respect to the shaded areas. The relative concern of each parameter is necessary to proceed to the next step in the assignment of a GCR.



NONE SLIGHT MODERATE IMPORTANT VITAL CONCERN

	1	2	3	4	5	6	7	8	9	10
SAFETY	▨			▨	▨			▨	▨	▨
MISSION COMPLETION	▨				▨	▨			▨	▨
EFFICIENCY	▨	▨			▨	▨			▨	▨
SYSTEM RELIABILITY	▨	▨			▨	▨	▨			▨
COST	▨	▨				▨	▨			
	1	2	3	4	5	6	7	8	9	10

Figure 2-2 Goal Criticality Criteria Assessment Chart

Using the information from the GCC Assessment Chart, the analyst then utilizes the GCR Flowchart (Figure 2-3) to assign an overall rating to the task. This flowchart has been modelled after a modified Cooper-Harper Aircraft Handling Characteristics Scale [Reference 6]. The Cooper-Harper scale is often used for system workload assessment because it provides a simple decision tree with well-defined criteria to guide the assignment of rating values in response to a series of statements or questions. Because of these advantages, an assessment flowchart similar to the Cooper-Harper chart was developed to assist the BSC analyst in the GCR assignment process. This flowchart, in conjunction with the GCC Assessment Chart, has been developed to maintain a systematic and consistent approach when analyzing a large number of tasks. A further advantage of this process is that it serves to identify the key elements, which must be included in the explanatory rationale for the rating.

After the GCR value has been assigned to each task, the following two adjustment factors are incorporated to obtain the AGCR:

a. an estimation of the degree to which goal achievement may be limited by critical human performance (in this context, critical human performance is defined as the degree to which goal achievement requires the use of equipment with design characteristics that require performance which exceeds human capabilities); and

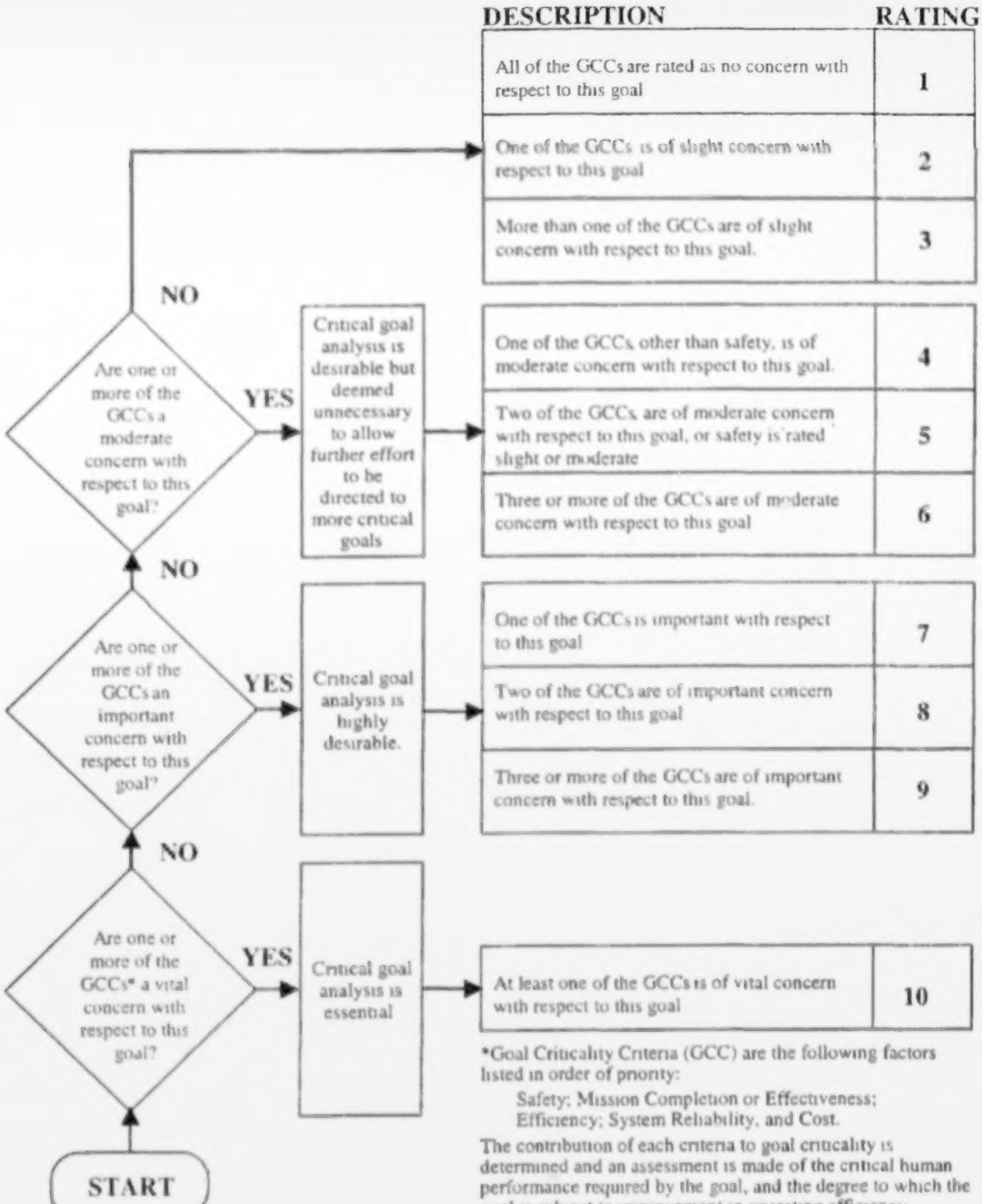
b. an estimation by the analyst of the potential ease of goal improvement based on the following criteria:

    (1) if achievement of a goal could be improved through a change in procedure, it is considered that improvement following analysis would be likely,

    (2) if achievement of a goal could be improved through a change in software (such as information display), it is considered that improvement may result from further analysis, and

    (3) if improvement is expected to require extensive hardware modification, improvement following further analysis is considered unlikely.

The relative impact of each of these adjustment factors is assessed on a scale of 0 to 2. For each factor, an assessment of either 1 or 2 (indicating some impact) results in the basic criticality rating (the GCR) being increased by one (a zero assessment results in no change). Consequently, the AGCR can be as much as two points higher than the GCR (that is, for tasks in which both factors have an impact). However, the AGCR is not allowed to exceed the maximum rating of 10.


START
Are one or more of the GCCs* a vital concern with respect to this goal?
YES
Critical goal analysis is essential
NO
Are one or more of the GCCs an important concern with respect to this goal?
YES
Critical goal analysis is highly desirable.
NO
Are one or more of the GCCs a moderate concern with respect to this goal?
YES
Critical goal analysis is desirable but deemed unnecessary to allow further effort to be directed to more critical goals
NO

DESCRIPTION	RATING
All of the GCCs are rated as no concern with respect to this goal	1
One of the GCCs is of slight concern with respect to this goal	2
More than one of the GCCs are of slight concern with respect to this goal.	3
One of the GCCs, other than safety, is of moderate concern with respect to this goal.	4
Two of the GCCs are of moderate concern with respect to this goal, or safety is rated slight or moderate	5
Three or more of the GCCs are of moderate concern with respect to this goal	6
One of the GCCs is important with respect to this goal	7
Two of the GCCs are of important concern with respect to this goal	8
Three or more of the GCCs are of important concern with respect to this goal.	9
At least one of the GCCs is of vital concern with respect to this goal	10

*Goal Criticality Criteria (GCC) are the following factors listed in order of priority:

Safety; Mission Completion or Effectiveness; Efficiency; System Reliability, and Cost.

The contribution of each criteria to goal criticality is determined and an assessment is made of the critical human performance required by the goal, and the degree to which the goal is subject to improvement in operating efficiency.

Figure 2-3 Goal Criticality Rating Flowchart

2.4.4.1 Rationale for the Methodology for Assigning Goal Criticality Ratings and Adjusted Goal Criticality Ratings

A simple binary assignment of "critical" or "not-critical" could have been used. However, the systematic assignment of GCRs and AGCRs to values from 1 to 10 is particularly beneficial because of the greater potential information content offered by the multi-level scale. Advantages offered by this methodology include:

a. consistent assignment of criticality ratings;

b. systematic incorporation of the key co-factors which must be considered for the overall assignment of goals for review and modification;

c. the ability to prioritize goals during the performance prediction analysis; and

d. more effective goal modification, if deemed necessary by excessive human demands or workload levels.

The goals that are the most critical to mission success will be identified along with the rational for the critical rating.

2.4.5 Conduct Information Flow and Cognitive Processing Analysis

2.4.5.1 Develop Operational Sequence Diagrams

OSDs were prepared for the day freedeck landing and one in-flight emergency. OSDs provide a graphical representation of the flow of operator tasks and information against mission time. Symbology is used to indicate actions, monitoring activities, time delays, and decisions. The main purpose of the OSDs is to provide a diagrammatical representation of the composite mission scenario sections and segments. The OSDs are used in conjunction with the goal inventory to translate the information flow and goal performance into the network model.

The OSDs were prepared in accordance with traditional BSC practices. They are particularly useful for the analysis of highly complex systems, which require many time-critical information-decision-action functions by the operators. By using symbology to indicate actions, inspections, data transmission and reception, data storage, time delays and decisions, the OSDs show the flow of information through the system in relation to the mission timeline. Special symbols have been incorporated into the OSDs to provide the additional information necessary for the translation to a probabilistic model.

2.4.5.2 Conduct Information Flow and Cognitive Processing Analysis

The Information Flow and Cognitive Processing Analysis was conducted based on the network model OSDs. The OSDs provide a very effective framework upon which to base the information flow and cognitive processing analysis in that they provide the necessary task sequencing information. The other major inputs to this analysis are the goal analysis results referenced in Subsection 2.4.2. These tables identify the other required factors, including the initiating conditions, information required, operator output behaviours, input sensations, and decisional components.

This information directs an analyst to the tasks that require the most intensive information flow and processing. The results of this analysis will assist with an assessment of the current Sea King environment and provide information critical to the development of an intelligent agent.

BSC used goal sequencing and concurrency information from the OSDs, combined with task information from the detailed goal to analyze the flow of information for the Sea King aircrew. Each critical goal sequence was studied to establish the following parameters:

a. a summary of information requirements;

b. potential information sources for each category of information (for example, radio transmission, hard copy documents, flight instruments, sensors, visual observations, and memory);

c. potential information retrieval methods for each category of information (for example, visual and electronic (multiple multi-function displays), proprioceptive, kinaesthetic and vestibular feedback, and cognitive recall);

d. information processing required (for example, cognitive, data entry, decision-making, and discussion);

e. decisions required;

f. decision-making processes (for example, cognitive only, operator-assist tools, and automated systems);

g. information produced; and

h. destinations and transfer methods for information produced.

This analysis will be used to generate information that would support the end objective of the analysis—the development of intelligent agents for use in training environments.

The information generated will consist of:

a. situational awareness issues;
b. consequence of error issues;
c. workload issues; and
d. summary of findings.

2.5 INPUT DATA INTO IPME MODEL

2.5.1 General

The IPME database is not currently available to support a completion Mission, Function, and Goal and Task Analysis. As such, the detailed and critical goal data was established within a parallel SOLE database structure. To support the development of an IP and IPME-based network model, a subset of the goal data was migrated to the IPME toolset. These data included:

a. goal labels and description;
b. completion time;
c. attentional demand ratings;
d. anthropometric modelling data; and
e. release conditions and end effects.

In so far as the dataset is not extensive (less than 185 goals), it was not practical to establish an electronic transfer facility, but rather to enter the data manually.

2.5.2 Integrate Network Control Elements into the Model

The flexibility of the IPME network modeller and data collection facility provides for the inclusion of a variety of model elements that support this exercise, including:

a. scenario events as defined by the composite scenario;
b. local and global variables for data collection and network control; and
c. release conditions and end effects for network control

The SOW [Reference 3] defined a series of random elements to be included into the model for the analysis phase, including communications, emergencies, and chaotic environmental events. In a traditional SOLE analysis these mission elements are "hard coded" into the network, thereby limiting the potential impact of the event. IPME provides the functionality required to include these model elements as events which may occur during the conduct of the mission. These components to the composite scenario were extended such that they may occur on a random basis, in accordance with the constraints established through discussions with the Technical and Scientific Authorities and Domain Experts.

To facilitate the integration of these events, control of the network in general, and the collection of data, a system of local and global variables was established and maintained throughout the goal inventory. These variables were defined on an as required basis during the network model development exercise.

The variable set (external and internal) also facilitates the development of release conditions and end effects for all nodes in the network, augmenting the degree to which the network will be controlled or modified to model a particular environment or condition.

Upon completion of the network model development exercise, the model was executed to the extent necessary to ensure that:

a. it was functional;
b it corresponded to the network model as described in the OSDs; and
c. scenario events were established and accommodated.

SECTION THREE – MISSION ANALYSIS

3.1 GENERAL

The objective of the Sea King mission analysis is to establish the basis for a subsequent HFE analysis of deck landings to be used in the future development of intelligent software agents. Mission Analysis forms the basis for the identification and analysis of operator functions, the development of a model for predicting human performance and developing MOEs, and the analysis of information flow. A complete description of the mission analysis methodology is provided in Subsection .

This section describes the results of the mission analysis phase, and is subdivided as follows:

a composite mission scenario; and
b. measures of effectiveness.

3.2 COMPOSITE MISSION SCENARIO

Three composite mission scenarios, in narrative form, were developed to provide a framework for the evaluation of the goals of the Sea King crew during deck landings. Typically only one scenario, consisting of a series of (potentially) unlikely events, is created to facilitate the analysis of the most demanding mission segments. However, because of the nature of the mission segment being analyzed, that is, deck landings under varying environmental conditions, it was impractical to connect three landing sequences in one scenario. The composite scenarios are included in Annex B.

3.3 MEASURES OF EFFECTIVENESS

From the working group session held with the Scientific/Technical Authority at the initial meeting a list of MOEs were developed. The nature of the MOEs that may be extracted from an analysis utilizing modelling toolsets were compared with the nature of MOEs relevant to the operational domain. It was determined that the operational domain does not significantly impact the nature of the MOEs to be captured, and that the MOE set to be considered was consistent with the traditional data set associated with a SOLE analysis. As such, the following MOEs were identified for the modelling exercise:

a. number of tasks shed;
b. number of interrupted tasks;
c. number of times each task is delayed;
d. number of critical task sequences;
e. total time spent in critical tasks;
f. percentage of time spent with time pressure exceeds a value of 1;
g. total number of times time pressure exceeds a value of 1; and
h. mission completion time.

SECTION FOUR – HIERARCHICAL DECOMPOSITION

4.1 GENERAL

The objective of the hierarchical decomposition was to identify the functions and supervisory goals (and sequences of functions) that must be performed to achieve mission objectives (that is, safely land the helicopter on the ship). The function analysis is based on a particular system, although the higher-level functions and supervisory goals are largely independent of the system being analyzed. For this analysis, the system was defined as the Sea King cockpit. The methodology for the hierarchical decomposition is described in Subsection 2.3.

The hierarchical decomposition established the basis for the subsequent goal analysis, information flow and cognitive processing analysis, and network model development. The hierarchical decomposition also resulted in the following data products (which are described briefly in Subsections 4.2 and 4.3):

a. graphical representation of the decomposition; and
b. goal inventory.

A theorized advantage of a PCT analysis is the introduction of supervisory goals at the upper levels (top, first, second, third) of the hierarchical decomposition. The PCT methodology requires that all higher-level goals/objectives to be assigned to a specific human or machine. The exception occurs if all lower-level goals contributing to the achievement of the higher-level goal are assigned to the same operator. In such cases, there is no need to assign the higher-level goal to a specific operator, or even to define the higher-level goal in the network model. Because of the SOPs in the Sea King cockpit, particularly the communication protocols, the supervisory goals are imbedded in the network at the lowest level. As a result, only one supervisory goal, at the top level of the decomposition, was identified.

4.2 GRAPHICAL REPRESENTATIONS OF THE HIERARCHICAL DECOMPOSITION

Graphical representations of the top-, first-, and second-levels of the hierarchical decomposition are provided at Annex C. The graphical representations illustrate the logical and chronological relationships between the various mission functions and related supervisory goals. The top-level functions presented in the graphical representations include:

a. Approach;
b. Landing;
c. Take-off; and
d. Departure.

4.3 GOAL INVENTORY

Annex D contains a listing of all goals that resulted from the decomposition of the composite scenarios. The associated top-, first-, second- and third-level functions and supervisory goals are also included.

SECTION FIVE – GOAL ANALYSIS

5.1 GENERAL

As explained in the methodology section (Subsection 2.4), the goal analysis for the Sea King deck landings included both a "detailed goal analysis" and a "critical goal analysis." The primary objective of these analyses was to develop a database of information related to goal achievement. This information is used to support virtually all subsequent analysis activities, including the identification of deficiencies within the existing system, the definition of requirements for a replacement system, and the future development of intelligent agents.

The remainder of this section presents the gross and critical task analysis results, which are contained at Annexes E and F respectively.

5.2 DETAILED GOAL ANALYSIS

The following gross task analysis results are presented for all unique tasks at Annex E (a separate double-sided page is devoted to each unique goal):

a. **Initiating Conditions**—a narrative description of the conditions that would cause the goal to be attended;

b. **Initiating Actions**—a narrative description of the actions to be taken in attending to the goal;

c. **Ending Conditions**—a narrative description of the conditions that would cause attendance of the goal to be terminate (that is, the goal has been achieved),

d. **Ending Actions**—a narrative description of the actions to be taken when the goal has been achieved;

e. **Declarative Knowledge Requirements**—narrative descriptions of the general knowledge, e.g. facts, the meaning of symbols, or standard operating procedures, required to achieve the goal;

f. **Situational Knowledge Requirements**—narrative descriptions of the mission specific knowledge required to achieve the goal;

g. **Output and Behaviours**—an assignment of the human behaviours, and related cognitive perceptual process categories, for goal attendance (see Table 2-1);

h. **Input and Sensation**—an assignment of the input sensations, and related cognitive and perceptual process categories, for assessing goal achievement (see Table 2-2);

i. **Influenced Variables (External)**—a listing of the external variables within the control loop that the operator affects while attending to the goal (external variables are observable by a third party);

j. **Local and Global External Variable**—for each external variable, indicates if the external variable is only influenced by one operator (local) or can be influenced by many operators (global);

k. **Output Interface**—a listing of the interfaces the operator uses to interact with the external world;

l. **Influenced Variables (Internal)**—a description of the operator's perception as to whether the goal has been achieved or not (internal variables are not observable by a third party);

m. **Input Interface**—a listing of the interfaces which influence the operator's perception as to whether or not the goal has been achieved; and

n. **Goal Criticality Rating (GCR), Adjusted GCR (AGCR), and Rationale -** an indicator and rationale of the criticality of the goal as required for the performance predictions, and to identify those goals that warrant a more detailed analysis during a subsequent analysis phase (Subsection 2.4.4);

o. **Visual, Auditory, Cognitive, Psychomotor (VACP) Ratings**—attentional demand ratings in each of the four modalities as an indicator of the demands imposed on the human during the performance of the task (see Table 2-3);

p. **Probabilistic Goal Completion Times** – estimates of the time required for the operator to successfully achieve the goal. Note: the completion time may be expressed as a traditional probabilistic distribution (normal, triangular, etc) or a function to be calculated prior to goal initiation;

q. **Feedback to Higher-Level Goals?** - a "yes" or "no" indication of whether the achievement of the goal influences one or more higher-level goals. The HGA process has adopted the assumption that if feedback is provided to a higher-level goal, the goal to which feedback is provided is the parent to the goal being analyzed (ie. there is a direct PARENT – CHILD relationship associated with this feedback element). Any feedback relationship other than this default must be identified.

r. **SAFEWORK Data Elements:** to facilitate a link to the anthropometric modelling environment, data elements were provided for each lower level goal to enable the manipulation of a mannequin within the SAFEWORK application. The data required defined the following aspects of the goal:

   1) **Body Part**—a narrative description of the body part(s), for example, left foot or right index finger, used in achieving each goal;

2) **Target**—a narrative description of interface elements in the cockpit, for example, cyclic or pedals, that are manipulated by each body part in achievement of the goal; and

3) **Action**—a narrative description of the manipulation of a target required to achieve the goal.

5.3 CRITICAL GOAL ANALYSIS

As described in the critical goal analysis methodology (Subsection 2.4.3), the most critical tasks were analyzed in greater detail to obtain additional information that will eventually be used to contribute to the design of the user interface. Table 5-1 provides the distribution of adjusted goal criticality ratings as determined for all unique tasks during the detailed goal analysis phase. For the analysis of the Sea King deck landings, all tasks assigned an AGCR greater than 7 were deemed "critical", and were included in the critical goal analysis. This included 27 of 80 unique tasks (that is, 33.7%) which is slightly above the typical 10 to 15% identified in similar analyses; however, it is considered to be the level required to ensure that the most critical tasks are captured.

Table 5-1 Distribution of Adjusted Task Criticality Ratings

Adjusted Task Criticality Rating	Number of Unique Tasks	Percentage
1	1	0.75
2	10	7.5
3	16	11.9
4	0	0
5	45	33.6
6	2	1.5
7	28	20.9
8	9	6.7
9	1	0.75
10	22	16.4
Totals	**134**	**100.0**

The results of the critical goal analysis are documented at Annex F, with a separate page devoted to each unique goal. The critical goal analysis results contained in the annex include the following information:

a. information available;
b. evaluation process;
c. decision reached after evaluation process;
d. body movements required by action taken;
e. workspace envelope required by action taken;
f. workspace envelope available;
g. location and condition of work environment;
h. frequency and accuracy of action;
i. tools and equipment required;
j. specialty, experience, and number of personnel required;
k. job aids or references required;
l communications required (including type);
m. special hazards involved;
n. operator interaction;
o. operational limits of personnel; and
p operational limits of machine and software.

A detailed description of each critical goal analysis data field is provided in Subsection 2.4.3.

SECTION SIX
INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS

6.1 GENERAL

The results of the information flow and cognitive processing analysis are documented in Annex H. The objective of this analysis was to determine the basic information flows, information management processes and decision-making processes required to maintain safe flight conditions. This analysis was intended to provide an understanding of various aspects of information flow, including: the information required to initiate tasks or machine functions; where the information should come from; how it should be communicated and managed, what must be done to it during task performance (that is, processing), how the information should be managed; and the information produced during task performance and where it should be sent.

The methodology for this analysis is described in Subsection 2.4.5. The methodology involved a very detailed analysis of 2 critical task sequences defined by the BSC analysts from the OSDs. The remainder of this section identifies the critical task sequences, and provides a brief rationale for their selection for the analysis. This section also provides a brief introduction to the results presented in Annex H.

6.2 DEVELOP OPERATIONAL SEQUENCE DIAGRAMS

As explained in Subsection 2.4.5.1, OSDs are used to provide a graphical representation of the tasks being performed and the flow of information during the conduct of the composite mission scenario. For the Sea King deck landings, the OSDs reflect the performance of goals by the two model participants described below:

a. **Flying Pilot**—manipulates aircraft controls (cyclic, collective, pedals) to maintain the desired condition of flight; and

b. **Non-Flying Pilot**—monitors instruments, provides conning directions to the flying pilot.

6.3 SELECTION OF CRITICAL TASK SEQUENCES

A total of 2 critical tasks sequences were selected from the OSDs presented at Annex G. These task sequences were chosen based on a subjective assessment of their importance to the mission segment and the likelihood that they would highlight specific issues related to the development of intelligent agents.

The critical task sequences selected from each of the mission sections and segments, and providing a brief rationale for their selection, are identified in a. and b. below:

a. Mission Section 1: Approach and Landing
Mission Segment 1: Freedeck Landing - Daytime

(1) **Landing Sequence Day Freedeck**: communications with ship (LSO), maintain low hover, receive conning, lower aircraft, lower probe;

b. Mission Section 1: Approach and Landing
Mission Segment 2: ASE Failure

(1) **ASE Failure - Troubleshooting**: briefing on ASE failure indications, switch hover indicator mode, observe circuit breaker status, order ASE reset, reset ASE.

The following analysis results are provided in Annex H for each critical task sequence (a separate double-sided page is devoted to each task sequence):

a. summary of information requirements;

b. potential information sources for each category of information (for example, external communication, hard copy mission-related documents, verbal briefing, electronic data processing system, memory);

c. information retrieval methods for each category of information (for example, radio, verbal communications, electronic, cognitive recall, courier);

d. information processing required (for example, cognitive, written or graphical records, data entry, decision-making, speech);

e. decisions required;

f. decision-making processes (for example, cognitive only, operator-assist tools, automated systems);

g. information produced;

h. destinations and transfer methods for information produced;

i. information management processes (for example, hard copy, commercial word processing applications, electronic database applications);

j. situational awareness issues;

k. timing issues;

l. consequence of error issues;

m. workload issues; and

n. summary of findings.

SECTION SEVEN – DEVELOP IPME NETWORK MODEL

7.1 MODELLING APPROACH

The hierarchical decomposition was to be completed within the IPME application. The initial concept included the successive decomposition within IPME to the lowest goal network level, capturing the equivalent of FFDs a series of sub-networks, with the logical branching between functional blocks captured. However, due to stability issues encountered with this modelling approach, the primary network was modelled at a single level. Sub-networks were used to capture elements of the scenario related to equipment failures/malfunctions.

Two random events or emergencies, an ASE failure and a Communications (comms) failure, were included in the network model. The comms failure was assumed to have occurred and been diagnosed prior to the tasks in the network model, while the ASE failure was assumed to occur any time during the approach phase of the mission. Only one emergency was allowed to occur per simulation, i.e. only the comms or the ASE could fail during a particular iteration of the model. Randomly generated probabilities were used to determine which, if any, of the systems were to fail during model execution. The network paths representing the task sequences associated with equipment malfunctions were initiated using the Start (*task, tag*) function embedded in the ending effects of the task preceding the alternative network paths. The ASE failure was modelled as a task with no operator assignment and a normal time distribution with a large standard deviation. The subsequent events in the ASE failure branch would only execute if the release condition, which checked for an existing comms failure and the appropriate phase of flight, evaluated to the correct value.

Because communications within the cockpit and with external agencies (including the aircrew in the cabin area) are so prevalent, a "mini-network" was created to represent this block of tasks. Operator assignments and task completion times within the communication network were dynamic and calculated in the beginning effects of a "logic" task in the main network path. This logic task was also used to call the communications network using the Start(*task, tag*) function.

7.2 SAFEWORK™ DATA COLLECTION

To embed the data elements necessary to animate an anthropometric mannequin in the network model, a series of user defined variables and functions were established. The variables represented the body parts used to perform a task, e.g. right index finger or both feet, the type of action required (if necessary), e.g. grasp, or push, and the physical components involved, e.g. external scene or flight controls. For each task in the network, a user-defined function was called in the beginning effect to set the state to TRUE for those elements involved in the task. At the end of the tasks, a function call in the ending effects set those elements to FALSE.

To accommodate this approach, the network established within IPME must:

a. provide goals at the lowest level of decomposition with a resolution consistent with the individual anthropometric parameters. Specifically, each goal must be bound by a single allocation to any of the links to the SAFEWORK model, ie. the eyes can only be allocated to one specific field of view and/or the right hand can only be attached to a single control system for the duration of the goal. In historical analyses using such task measures as the VACP protocols, it was possible to establish task boundaries using the characteristics attentional descriptor. However, the boundaries set using these data points will not necessarily accommodate the various eye, hand, foot, etc components within a single task or goal; or

b. a series of scripts must be created to model the proportion of time spent, during the conduct of a single goal, to the various sub-components within that goal. This is analogous to the decomposition of the goal to the sub-goal level.

The IPME toolset does not require that all goals be decomposed at or to the same level. As such, it is possible to adjust the resolution of the decomposition, for either the entire analysis or a specific segment, to accommodate the nature of the study to be performed.

SECTION EIGHT – CONCLUDING MATERIAL

8.1 DISCUSSION

The goal of this hierarchical decomposition differed from a typical HFE analysis, and consequently has led to recommendations and conclusions of a different nature than might be expected. While the typical aim of an HFE analysis is to identify deficiencies in the current environment and propose remedies, the goal of this project was to develop a scenario-based network model that has the potential to be linked to the Safework™ anthropometric modelling tool.

The primary observation to be made relates to the significant duplication of effort required in the conduct of this work, especially due to the toolset. Much of the data was manipulated twice because of the current limitations of IPME. The FFDs[1] and OSDs were effectively generated twice, once using SOLE tools and once within IPME. The FFDs were developed within the Visio application requiring that the networks were recreated within IPME, as the IPME network view is not suitable for SME review (inadequate text labels, low resolution printing, etc). Additionally, although an OSD facility is currently in development, the present output is not sufficiently mature to produce a document suitable for SME review. As a result, the OSDs were generated using the SOLE toolset and the network model was then manually recreated within IPME from these drawings. A number of data elements captured in the MS-Access database were duplicated in the IPME model, e.g. goal completion time or VACP ratings, adding to the duplication of effort. It is anticipated that the evolution of the IPME tool, with the inclusion of the Human Factors Analysis Tool (**HFAT**) facility will reduce the current overhead associated with a MFTA/HGA and the network modelling in IPME.

A secondary observation relates to the data collected during the analysis. To capture the data required for both the animation of the anthropometric mannequin and the completion of the HGA, several data fields needed to be completed. These data fields contained similar or overlapping data elements. As an example, the elements of the anthropometric data bore great similarity to the input/output interface elements of the HGA. If the intention to link the tasks/goals established within IPME to the Safework™ application is to be progressed, the data elements must be rationalized to optimize the data generation effort.

8.2 CONCLUSIONS

The following conclusions can be drawn from the HGA conducted:

a. HGA and the IPME can be effectively used to capture the data required to animate an anthropometric mannequin (with minor limitations);

b. there is a duplication of effort currently required to capture anthropometric and HGA data elements; and

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[1] Section 7.1.

c. the IPME toolset is not mature, in particular, it does not fully support the complex relationships that may exists in a hierarchical decomposition.

8.3 RECOMMENDATIONS

It is recommended that the development and integration of HFE modelling tools such as Safework™ and the IPME be continued. To further this, it is specifically recommended that the following enhancements be made to the IPME:

a. enhancements to micro-models and operator characteristics, traits, and states be made to facilitate the future animation of Safework™ mannequins;

b. facilities to minimize duplication of data collection efforts, i.e. integration of PCT and anthropometric data, be implemented;

c. outstanding stability issues, particularly related to logical relationships between sub-networks, be resolved; and

d. the OSD draw routine and other elements of the HFAT be implemented to yield an integrated tool for Hierarchical Goal/Mission Function Task Analyses.

SECTION NINE – REFERENCES

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ANNEX A

GLOSSARY OF TERMS AND ACRONYMS

ANNEX A – GLOSSARY OF TERMS AND ACRONYMS

AGCR	adjusted goal criticality rating
BSC	BAE SYSTEMS CANADA INC
CMC	Canadian Marconi Company
DCIEM	Defence and Civil Institute of Environmental Medicine
DND	Department of National Defence
GCC	goal criticality criteria
GCR	goal criticality rating
HFE	human factors engineering
HLA	high-level architecture
IP	information processing
IPB	Intelligence Preparation of the Battlefield
IPME	Integrated Performance Modelling Environment
MIL-HDBK	Military Handbook
MOE	measure of effectiveness
OSD	operational sequence diagram
PCT	Perceptual Control Theory
SOLE	Systems Operator Loading Evaluation
SOP	Standard Operating Procedure
SOW	Statement of Work
VACP	visual, auditory, cognitive, psychomotor modalities

ANNEX B

COMPOSITE MISSION SCENARIOS

ANNEX B – COMPOSITE MISSION SCENARIOS

B.1 COMPOSITE MISSION SCENARIO 1 – DAY DECK LANDING / LIGHT SEAS (FREEDECK)

The mission is set off the west coast of Vancouver Island. HMCS Regina and her embarked helicopter Air Detachment (**Airdet**) are half way through the two-week long annual Operations Room Officer Course deployment. Since it's a Sunday morning, the fleet's flex has eased slightly from the gruelling schedule of evolutions and allowed for some alternate training for the Airdet.

0940 hrs The helicopter, Stinger 36, is inbound for landing after a quick run ashore to pick up coffee and fresh doughnuts. The time is 0940 hours on a clear day with sea state 5 conditions. The last meteorological report the pilot received from Tofino Coast Guard Radio indicated no overcast skies with unlimited visibility. The barometric pressure is steady at 30.00 millibars. The True Wind is from 303 degrees true at 17 knots with no gusts and the outside air temperature is 12 degrees Celsius.

Stinger 36 has been in contact with Regina for the last 25 nautical miles and is under loose advisory control by the Shipborne Air Controller (**SAC**). Since the Commodore is in the back drinking his hot coffee, the pilot, who is also the Maritime Helicopter Crew Commander (**MHCC**), is in the right seat, and comments that she wants this to be a smooth evolution for recovery. She doesn't want to be the lucky one to stand first duty when they arrive in San Diego because of the Commodore scalding himself. Her brand new co-pilot looks over, grunts his assent and passes control back to her for the approach and landing. The pilot asks the co-pilot to complete the pre-landing checklist, which he does and informs the pilot that the Safe Single Engine Speed is 34 knots. All crew and passengers are securely strapped in and ready for landing.

0950 hrs At ten miles out, the co-pilot sights the ship sailing perpendicular to the helo's flying course and informs the crew. The TACCO calls the ship and tells them they are visual. The SAC acknowledges and calls, "Standby numbers – Flying course 360 at 5, True wind 303 at 17, Relative wind Red 45 at 22, Altimeter 3000." The TACCO acknowledges, "Roger".

Confirming all stations are closed up at flying stations, the Landing Safety Officer (**LSO**) in Regina makes the Recover light on the control panel to request permission to recover the helo. The "No" light illuminates in response from the Bridge.

0951 hrs The SAC calls the helo on the Primary UHF frequency being monitored and requests a switch to the Land/Launch frequency. The TACCO acknowledges the transmission and requests the non-flying pilot to make the change. The co-pilot checks his briefing guide to find the correct frequency, makes the switch, and informs the TACCO over the intercom of the new frequency. The TACCO calls the SAC, "Regina, this is Stinger 36, over" and the SAC replies, "Stinger 36 Roger, the ship is closed up at flying stations, Radhaz safe, you're cleared to close." The TACCO acknowledges the transmission.

0954 hrs At about 3 miles away the LSO spots the helo and informs the SAC that he is visual and happy to take control. The SAC acknowledges the LSO and transmits to the helo, "Call Paddles for control" Over the intercom the TACCO tells the pilots, "Your radios" and the co-pilot responds, "Roger, my radios". He calls the SAC on L/L and says, "Roger, break, Paddles, this is Stinger 36 calling you for control". The LSO responds, "Stinger 36, this is paddles, over". The co-pilot says, "Paddles, 36, roger, out".

0956 hrs Regina has been slowly steaming west and as the helo approaches, the Officer of the Watch (**OOW**) orders the helm to come to the flying course. Watching the compass in the Howdah, the LSO sees the ship coming within 90 degrees of the flying course and calls over the radio, "Stinger 36, this is paddles, Signal Delta Hover Astern". As the LSO makes this call, FLYCO switches the trafficator lights to amber. The co-pilot acknowledges the transmission and the pilot calls for the panel checklist to be completed. The co-pilot calls out the action items as he makes to check them. "Tail Wheel – Locked, Brakes – Set, Sonar…". The Aesop replies, "Seated and sighted". The co-pilot continues, "Throttles – Full, Winch – Down, Tail probe – Up". As he finishes he informs the pilot by saying, "Panel check complete, landing gear to go", which the pilot acknowledges.

0957 hrs The pilot begins her approach at a speed of 90 knots and 200 feet and commences a gradual descent and deceleration. About 300 yards behind the ship the co-pilot calls, "Safe single". Shortly thereafter, the helo comes nicely into a relative hover, aft of the ship and on her port side in the Delta Hover Astern position. As the helo approaches, the pilot does a quick scan of the flight deck for safety considerations and notes that the LSO has rigged for a freedeck recovery. This seems appropriate to her since the ship is not moving to any great extent. She estimates the movement of the ship to be pitching no more than 3 degrees and rolling no more than 10. She sees that the amber trafficator is illuminated and maintains her hover waiting for the LSO to give her clearance.

0958 hrs Being satisfied that the ship is ready to recover the helo in all respects, the OOW calls the Captain in his cabin, informs him of the situation and ask for permission to recover the helo. The Captain, not wanting to annoy the Commodore by making him wait, gives his authorization. The OOW thanks him, hangs up the phone and makes the "Yes" light on the request panel. He calls the LSO and says, "Numbers remain the same". The LSO acknowledges.

0959 hrs Doing a final check of the deck and airspace around the ship the LSO is satisfied that all is in order. He calls the helo, "Stinger 36, this is paddles, Signal Charlie Freedeck". As this call is made, FLYCO switches the trafficator lights to green. The pilot acknowledges the transmission and moves the helo directly forward into the position abeam the landing spot. As she lines up with the bum lines on the deck, the co-pilot reaches down and lowers the landing gear handle. The gear cycles and locks into place with a clunk. He checks the indicators on the panel and then looking out his window into the mirror he checks the bug light on the port landing gear to ensure it's illuminated. Seeing that all is in order from his side he tells the pilot, "I've got a light." The pilot looks through her own rear view mirror and confirms the same. The co-pilot calls, "Gear down and locked."

The pilot begins to traverse the helo laterally over the flight deck and lines herself up longitudinally using the horizon bars as reference. As the helo moves into the high hover position, FLYCO switches the trafficators to amber. The pilot waits for the ship to find a steady period and once comfortable with the helo's position in the high hover, she smoothly lowers the collective and guides the helo down. This motion is more akin to an elevator going straight up and down, rather than a leaf swaying back and forth in the wind on it's way to the earth.

As she reaches the low hover, she stabilizes the helo's position and the co-pilot gives her minor conning. "Left two, steady, ahead one, steady, good position…good position." This direction continues until she is comfortable with the station and recognizes the ship to be in a steady state again. At this, she promptly calls over the radio, "Ready to land". The LSO being wide awake and greatly looking forward to the fresh doughnuts, sees that the helo is in a good position to land and calls, "Land now, down, down, down". FLYCO switches the trafficators to green and when the pilot hears the executive and sees the green lights she abruptly lowers the collective and the helo plunges to the deck. At the last moment a slight lateral motion causes the helo to become misplaced and it hits the side of the trap causing the helo to sway sharply from side to side. The pilot grimaces knowing she'll be doing duty for sure now. The LSO sees that the helo missed its mark and calls, "Wave off, wave off, wave off". FLYCO switches the trafficators to red. The pilot responds, "Roger, wave off, wave off, wave off" and smoothly raises the collective, lifting the helo back into the air to the high hover. When he sees the helo is clear of the deck, the LSO calls, "All clear" and the trafficators are switched to amber again.

1000 hrs The pilot gathers her composure and repositions herself in the low hover. Again she calls, "Ready to land". The LSO being disappointed that he can't get to his Timbits soon enough makes sure that it goes properly this time. He calls, "Back, Back, Steady, Right, Steady, Good position" Being as experienced as he is, he waits for just the right time and calls, "Land now, down, down, down" and FLYCO make the lights green. This time, the helo lands squarely in the trap. As the helo's motion steadies out he closes the jaws of the trap and calls, "In the trap, trapped, down tail probe". When he sees the trap is closed and hears the LSO make the call, FLYCO switches the lights to amber. The co-pilot reaches up and makes the switch to lower the tail probe. The probe extends and the LSO sees it lock into the fish tail in the aft end of the flight deck. He calls, "Tail probe is down". As the LSO makes this call, the pilot depresses the ASE off button on her cyclic to disengage the stabilization system. The LSO switches the Recover light on his panel to off and call the Bridge, "Helo is trapped on deck, you're clear to manoeuvre with caution."

1001 hrs As the deck crew comes on deck to recover the doughnuts and the Commodore, the pilot thinks to herself, Well, I never really liked Tiajuana anyway….

B.2 COMPOSITE MISSION SCENARIO 2 – DAY DECK LANDING / HEAVY SEAS (HAULDOWN)

The mission is set off the west coast of Vancouver Island. HMCS Regina and her embarked helicopter Airdet are half way through the two-week long annual Operations Room Officer Course deployment. Since it's a Sunday morning the fleets' flex has eased slightly from the gruelling schedule of evolutions and allowed for some alternate training for the airdet.

0940 hrs The helicopter, Stinger 36, is inbound for landing after a quick run ashore to pick up coffee and fresh doughnuts. The time is 0940 hours on a clear day with sea state 6 conditions. The last meteorological report the pilot received from Tofino Coast Guard Radio indicated no overcast skies with unlimited visibility. The barometric pressure is steady at 30.00 millibars. The true wind is from 303 degrees true at 17 knots with no gusts and the outside air temperature is 12 degrees Celsius.

Stinger 36 has been in contact with Regina for the last 25 nautical miles and is under loose advisory control by the SAC. Since the Commodore is in the back drinking his hot coffee, the pilot, who is also the MHCC, is in the right seat, and comments that she wants this to be a smooth evolution for recovery. She doesn't want to be the lucky one to stand first duty when they arrive in San Diego because of the Commodore scalding himself. Her brand new co-pilot looks over, grunts his assent and passes control back to her for the approach and landing. The pilot asks the co-pilot to complete the pre-landing checklist, which he does and informs the pilot that the Safe Single Engine Speed is 34 knots. All crew and passengers are securely strapped in and ready for landing.

0950 hrs At ten miles out, the co-pilot sights the ship sailing perpendicular to the helo's flying course and informs the crew. The TACCO calls the ship and tells them they are visual. The SAC acknowledges and calls, "Standby numbers – Flying course 360 at 5, True wind 303 at 17, Relative wind Red 45 at 22, Altimeter 3000." The TACCO acknowledges, "Roger".

Confirming all stations are closed up at flying stations, the LSO in Regina makes the Recover light on the control panel to request permission to recover the helo. The "No" light illuminates in response from the Bridge.

0951 hrs The SAC calls the helo on the Primary UHF frequency being monitored and requests a switch to the Land/Launch frequency. The TACCO acknowledges the transmission and requests the non-flying pilot to make the change. The co-pilot checks his briefing guide to find the correct frequency, makes the switch, and informs the TACCO over the intercom of the new frequency. The TACCO calls the SAC, "Regina, this is Stinger 36, over" and the SAC replies, "Stinger 36

Roger, the ship is closed up at flying stations, Radhaz safe, you're cleared to close, call when visual." The TACCO acknowledges the transmission.

0954 hrs At about 3 miles away the LSO spots the helo and informs the SAC that he is visual and happy to take control. The SAC acknowledges the LSO and transmits to the helo, "Call Paddles for control" Over the intercom the TACCO tells the pilots, "Your radios" and the co-pilot responds, "Roger, my radios". He calls the SAC on L/L and says, "Roger, break, Paddles, this is Stinger 36 calling you for control". The LSO responds, "Stinger 36, this is paddles, over". The co-pilot says, "Paddles, 36, roger, out".

0956 hrs Regina has been slowly steaming west and as the helo approaches, the OOW orders the helm to come to the flying course. Watching the compass in the Howdah, the LSO sees the ship coming within 90 degrees of the flying course and calls over the radio, "Stinger 36, this is paddles, Signal Delta Hover Astern". As the LSO makes this call, FLYCO switches the trafficator lights to amber. The co-pilot acknowledges the transmission and the pilot calls for the panel checklist to be completed. The co-pilot calls out the action items as he makes to check them. "Tail Wheel – Locked, Brakes – Set, Sonar…". The Aesop replies, "Seated and sighted". The co-pilot continues, "Throttles – Full, Winch – Down, Tail probe – Up". As he finishes he informs the pilot by saying, "Panel check complete, landing gear to go", which the pilot acknowledges.

Start of Hauldown Senario

0957 hrs The pilot begins her approach at a speed of 90 knots and 200 feet and commences a gradual descent and deceleration. About 300 yards behind the ship the co-pilot calls, "Safe single". Shortly thereafter, the helo comes nicely into a relative hover, aft of the ship and on her port side in the Delta Hover Astern position. As the helo approached, the pilot does a quick scan of the flight deck for safety considerations and notes that the LSO has rigged for a hauldown recovery. This seems appropriate to her since the ship is moving fairly significantly. She estimates the movement of the ship to be pitching no more than 4 degrees and probably rolling about 15 degrees. To be certain, she calls paddles and asks, "Call the deck motion". The LSO replies and confirms her suspicions. The two-deck crew is waiting adjacent to the howdah waiting for the helo's approach. She sees that the amber trafficator is illuminated and maintains her hover waiting for the LSO to give her clearance.

0958 hrs Being satisfied that the ship is ready to recover the helo in all respects, the OOW calls the Captain in his cabin, informs him of the situation and ask for permission to recover the helo. The Captain, not wanting to annoy the Commodore by making him wait, gives his authorization. The OOW thanks him, hangs up the phone and makes the "Yes" light on the request panel. He calls the LSO and says, "Numbers remain the same". The LSO acknowledges.

0959:00 hrs Doing a final check of the deck and airspace around the ship the LSO is satisfied that all is in order. He calls the helo, "Stinger 36, this is paddles, Signal Charlie

Hauldown". As this call is made, FLYCO switches the trafficator lights to green. The pilot acknowledges the transmission and moves the helo directly forward into position abeam the landing spot. As she lines up with the bum lines on the deck, the co-pilot reaches down and lowers the landing gear handle. The gear cycles and locks into place with a clunk. He checks the indicators on the panel and then looking out his window into the mirror he checks the bug light on the port landing gear to ensure it's illuminated. Seeing that all is in order from his side he tells the pilot. "I've got a light." The pilot looks through her own rear view mirror and confirms the same. The co-pilot calls, "Gear down and locked."

0959:20 hrs The pilot begins to traverse the helo laterally over the flight deck and lines herself up longitudinally directly behind the close-in weapon system (**CIWS**). As the helo moves into the high hover position, the pilot calls to the co-pilot, "Lower the messenger". The co-pilot reaches up and makes the switch on the hauldown panel to begin lowering the messenger cable. On the flight deck, the deck crew and the LSO watch as the messenger appears from the main probe below the helo. When enough messenger line lowers to reach the flight deck and be safely grounded the LSO calls, "Stop Lowering". FLYCO switches the trafficators to amber. The deck crew moves underneath the helicopter to retrieve the messenger, ground it with the grounding rod, and hook up the hauldown cable. When ready, the crewman gives the LSO a thumbs-up and the LSO calls, "Raise the messenger". At this, FLYCO switches the trafficators to green. The co-pilot reaches over and makes the switch raising the messenger. As the cable reels into the helicopter, the deck crew watches for it to disconnect. When they are confident it will not, they begin backing out from under the helo and re-enter the hangar. The LSO watches as the ship's end fitting enters the main probe. The main probe retracts and then lowers indicating that the connection is successful. While the probe is cycling, the co-pilot watches the indicator lights on the panel change until all three green indicator lights are illuminated. When he sees them, he calls the pilot, "Three green", indicating the successful hookup.

1000:50 hrs Satisfied that all is in order, the pilot calls over the radio, "Three green, hover tension". The LSO confirms his panel is set correctly, applies hover tension and calls, "Hover tension". FLYCO switches the trafficators to amber. As the pilot begins to a sense a centring force on the helo she shifts the helo to the centre of the flight deck into the High Hover position and lines up with the High Hover references. She positions the helo such that she can view the horizon over the hangar and sets the lines painted on the hangar face between her feet. The fore and aft position is lined up with the bum lines. The pilot waits for the ship to find a steady period and once comfortable with the helo's position in the high hover, she smoothly lowers the collective and guides the helo down. This motion is more akin to an elevator going straight up and down, rather than a leaf swaying back and forth in the wind on it's way to the earth. The centring force of the hauldown tension helps her to keep accurate position as she descends.

As she reaches the low hover, she stabilizes the helo's position and the co-pilot gives her minor conning. "Left two, steady, ahead one, steady, good position…good position." This direction continues until she is comfortable with the station and recognizes the ship to be in a steady state again. At this, she promptly calls over the radio, "Ready to land". The LSO being wide awake and greatly looking forward to the fresh doughnuts, sees that the helo is in a good position to land and calls, "Land now, down, down, down" while applying landing tension. FLYCO switches the trafficators to green and when the pilot hears the executive and sees the green lights she abruptly lowers the collective and the helo plunges to the deck At the last moment a slight lateral motion causes the helo to become misplaced and it hits the side of the trap causing the helo to sway sharply from side to side. The pilot grimaces knowing she'll be doing duty for sure now. The LSO sees that the helo missed its mark and calls, "Wave off, wave off, wave off" and moves the hauldown handle to select minimum tension. FLYCO switches the trafficators to red. The pilot responds, "Roger, wave off, wave off, wave off" and smoothly raises the collective, lifting the helo back into the air to the high hover. When he sees the helo is clear of the deck, the LSO calls, "Hooked on, minimum tension" reminding the pilot that she is still hooked to the ship.

1001:30 hrs The pilot gathers her composure, checks the hauldown panel to ensure the three green indicator lights are still illuminated and calls, "Three green, hover tension". The LSO re-applies hover tension and confirms, "Hover tension". FLYCO switches the trafficators to amber again. When stable and the ship being in a steady period she again moves the helo into the low hover. Again she calls, "Ready to land". The LSO being disappointed that he can't get to his Timbits soon enough makes sure that it goes properly this time. He calls, "Back, Back, Steady, Right, Steady, Good position" Being as experienced as he is he waits for just the right time and calls, "Land now, down, down, down" while applying landing tension. FLYCO in turn make the lights green. This time, the helo lands squarely in the trap. As the helo's motion steadies out he closes the jaws of the trap and calls, "In the trap, trapped, down tail probe". When he sees the trap is closed and hears the LSO make the call, FLYCO switches the lights to amber. The co-pilot reaches up and makes the switch to lower the tail probe. The probe extends and the LSO sees it lock into the fish tail in the aft end of the flight deck. He calls, "Tail probe is down". As the LSO makes this call, the pilot depresses the ASE off button on her cyclic to disengage the stabilization system. The LSO switches the Recover light on his panel to off and call the Bridge, "Helo is trapped on deck, you're clear to manoeuvre with caution."

1002:30 hrs The LSO sets the hauldown panel appropriately and calls, "Release" The pilot depresses the release button and sees the 'Locked In' light on the hauldown panel extinguish. As the deck crew comes on deck to recover the doughnuts and the Commodore, the pilot thinks to herself, Well, I never really liked Tiajuana anyway….

B.3 COMPOSITE MISSION SCENARIO 3 – NIGHT DECK LANDING / LIGHT SEAS (FREEDECK)

Note: This scenario is *not* written utilizing NVGs since there is no such evolution or procedure. Pilots on the Sea King do not currently use NVGs in any operational context. Only the back end crew will use NVGs for certain tasks but not for ship board operations. All approaches, landings, take-offs and departures at night are done in the dark and on instruments.

The mission is set off the west coast of Vancouver Island. HMCS Regina and her embarked helicopter Air Detachment are half way through the two-week long annual Operations Room Officer Course deployment.

2340 hrs The helicopter, Stinger 36, is inbound for landing after conducting a sunset Corex. The time is 2340 hours on a clear night with sea state 5 conditions. The last meteorological report the pilot received from Tofino Coast Guard Radio indicated no overcast skies with unlimited visibility. The barometric pressure is steady at 30.00 millibars. The true wind is from 303 degrees true at 17 knots with no gusts and the outside air temperature is 12 degrees Celsius.

Stinger 36 has been in contact with Regina for the last 25 nautical miles and is under loose advisory control by the SAC. The SAC calls the helo on the Primary UHF frequency being monitored and requests a switch to the Land/Launch frequency. The TACCO acknowledges the transmission and requests the non-flying pilot to make the change. The co-pilot sitting in the left seat checks his briefing guide to find the correct frequency, makes the switch, and informs the TACCO over the intercom of the new frequency. The TACCO calls the SAC, "Regina, this is Stinger 36, over" and the SAC replies, "Stinger 36 Roger, the ship is closed up at flying stations, Radhaz safe, you're cleared to close." The TACCO acknowledges the transmission. The SAC calls, "Standby numbers – Flying course 360 at 5, True wind 303 at 17, Relative wind Red 45 at 22, Altimeter 3000." The TACCO acknowledges, "Roger".

The pilot, who is flying at the time and sitting in the right seat, is also the MHCC. She comments that she will conduct this landing to fulfil her quarterly proficiency requirements and that the intention will be to conduct a pilot monitored visual approach to the ship. She passes control to the co-pilot to conduct the approach. She then completes the pre-landing checklist and notes that the Safe Single Engine Speed is 34 knots. All crew are securely strapped in and ready for landing. The Aesop checks his radar and sees the ship is 10 miles away.

2350 hrs Confirming all stations are closed up at flying stations, the LSO in Regina makes the Recover light on the control panel to request permission to recover the helo. The "No" light illuminates in response from the Bridge.

At three miles out, the pilot sights the ship's running lights. The TACCO calls the ship and tells them they are visual. Noting the position of the mast, bow and running lights, the pilot determines that the ship is sailing perpendicular to the planned flying course and informs the crew. The helo approaches at 200 feet and 90 knots.

The LSO spots the helo and informs the SAC that he is visual and happy to take control. The SAC acknowledges the LSO and transmits to the helo, "Call Paddles for control" Over the intercom the TACCO tells the pilots, "Your radios" and the co-pilot responds, "Roger, my radios". He calls the SAC on L/L and says, "Roger, break, Paddles, this is Stinger 36 calling you for control". The LSO responds, "Stinger 36, this is paddles, over". The co-pilot says,, "Paddles, 36, roger, out". The LSO calls FLYCO and orders two-mile lighting to be selected.

2351 hrs Regina has been slowly steaming west and as the helo approaches, the OOW orders the helm to come to the flying course. Watching the compass in the Howdah, the LSO sees that the ship will not be on the flying course in time and calls the helo, "Stinger 36, this is Paddles, Signal Delta". As the LSO makes this call, FLYCO switches the trafficator lights to red. The co-pilot acknowledges the transmission at which time the pilot completes the panel checklist. The pilot calls out the action items as she makes to check them. "Tail Wheel – Locked, Brakes – Set, Sonar…". The Aesop replies, "Seated and sighted". The pilot continues, "Throttles – Full, Winch – Down, Tail probe – Up". As she finishes she informs the co-pilot by saying, "Panel check complete, landing gear to go", which the co-pilot acknowledges. The helo continues its inbound course.

2352 hrs The ship reaches the flying course as the helo over flies it. Now sure of the ship's aspect, she tells the co-pilot to turn the helicopter downwind. The OOW, being satisfied that the ship is ready to recover the helo in all respects, calls the Captain in his cabin, informs him of the situation and asks for permission to recover the helo. The Captain gives his authorization for the recovery. The OOW thanks him, hangs up the phone and makes the "Yes" light on the request panel. He calls the LSO and says, "Numbers remain the same". The LSO acknowledges and does a final check of the deck and airspace around the ship for safety. Being satisfied that all is in order, he calls the helo, "Stinger 36, this is paddles, Signal Charlie Freedeck". As this call is made, FLYCO switches the trafficator lights to green. The co-pilot acknowledges the transmission.

2354 hrs When the helo is far enough downwind, the co-pilot turns the helicopter back toward the ship to position it on the 180-degree inbound course. The co-pilot begins the approach at a speed of 90 knots and 200 feet and commences a gradual descent and deceleration. At about one mile astern of the ship the co-pilot asks the pilot to select one-mile lighting. The pilot acknowledges and switches the probe lights on, and the navigation and anti-collision lights off. The LSO sees this signal and calls the FLYCO and request ship's one mile lighting be made. FLYCO selects the ship's centre line lights off and illuminates the dustpan, hangar face, hangar top, horizon bars, and CIWS lighting.

2356 hrs In the final portion of the approach the co-pilot reverts to watching the instruments as the pilot continues to maintain visual contact. This level of instrument flying includes standard cross checks as with any instrument flying.

This pilot will use the standard 'T' cross check where the majority of the time will be spent monitoring the artificial horizon. In this case, special care will be given to observing altitude and airspeed.

Every few seconds the pilot confirms to the co-pilot that the heading altitude and airspeed are good. When necessary, the pilot will give conning to correct the helo's course. The pilot gives the co-pilot directions to progressively descend and decrease airspeed and steers the helo toward the port side of the ship. About 300 yards astern the co-pilot calls, "Safe single". As the ship becomes fully visible and the flight deck comes into focus the pilot begins to come on the controls. When comfortable with her references, she calls, "I have control". The co-pilot responds, "You have control" and releases the controls. Now the pilot is fully visual with the flight deck and continues her approach through the Delta Hover Astern position at about 40 feet altitude. In the meantime, the co-pilot continues to monitor the instruments calling altitude and airspeed to ensure the helo remains in a safe regime.

2357 hrs As the helo approaches, the pilot does a quick scan of the flight deck for safety considerations and notes that the LSO has rigged for a freedeck recovery. This seems appropriate to her since the ship is not moving to any great extent. She estimates the movement of the ship to be pitching no more than 3 degrees and rolling no more than 10. The pilot moves the helo directly forward into the position abeam the landing spot. As she lines up with the bum lines on the deck, the co-pilot reaches down and lowers the landing gear handle. The gear cycles and locks into place with a clunk. He checks the indicators on the panel and then looking out his window into the mirror he checks the bug light on the port landing gear to ensure it's illuminated. Seeing that all is in order from his side he tells the pilot, "I've got a light." The pilot looks through her own rear view mirror and confirms the same. The co-pilot calls, "Gear down and locked "

The pilot begins to traverse the helo laterally over the flight deck and lines herself up longitudinally using the horizon bars as reference. As the helo moves into the high hover position, FLYCO switches the trafficators to amber. The pilot waits for the ship to find a steady period. This landing sequence at night is especially challenging due to lack of reference to the horizon. Once comfortable with the helo's position in the high hover, she smoothly lowers the collective and guides the helo down. This motion is more akin to an elevator going straight up and down, rather than a leaf swaying back and forth in the wind on it's way to the earth.

As she reaches the low hover, she stabilizes the helo's position and the co-pilot gives her minor conning. "Left two, steady, ahead one, steady, good position…good position." This direction continues until she is comfortable with the station and recognizes the ship to be in a steady state again. At this, she promptly calls over the radio, "Ready to land". The LSO sees that the helo is in a good position to land and calls, "Land now, down, down, down". FLYCO switches the trafficators to green and when the pilot hears the executive and sees the green lights she abruptly lowers the collective and the helo plunges to the deck. At the last moment a slight lateral motion causes the helo to become misplaced and it hits the side of the trap causing the helo to sway sharply from side to side. The LSO sees that the helo missed its mark and calls, "Wave off, wave off, wave off". FLYCO switches the trafficators to red. The pilot responds, "Roger, wave off, wave off, wave off" and smoothly raises the collective, lifting the helo back into the air to the high hover. When he sees the helo is clear of the deck, the LSO calls, "All clear" and the trafficators are switched to amber again.

2358 hrs The pilot gathers her composure and repositions herself in the low hover. Again she calls, "Ready to land". The LSO calls, "Back, Back, Steady, Right, Steady, Good position" Being as experienced as he is, he waits for just the right time and calls, "Land now, down, down, down" and FLYCO make the lights green. This time, the helo lands squarely in the trap. As the helo's motion steadies out he closes the jaws of the trap and calls, "In the trap, trapped, down tail probe". When he sees the trap is closed and hears the LSO make the call, FLYCO switches the lights to amber. The co-pilot reaches up and makes the switch to lower the tail probe. The probe extends and the LSO sees it lock into the fish tail in the aft end of the flight deck. He calls, "Tail probe is down". As the LSO makes this call, the pilot depresses the ASE off button on her cyclic to disengage the stabilization system. The LSO switches the Recover light on his panel to off and call the Bridge, "Helo is trapped on deck, you're clear to manoeuvre with caution."

Glossary of Terms for Shipboard Helo Ops

Abort: Executive signal given to the helicopter in case of problems on launch. A common situation is when the main probe of the helo becomes stuck inside the RSD. The pilot must confirm this order by repeating it over the radio.

Airborne Electronic Sensor Operator (AESOP): The AESOP is the crewmember responsible for operating the Sonar, Radar and any other equipment on board the helo.

Airdet: Helicopter Air Detachment. Group embarked on HMC ship to conduct helicopter operations. This group consists of two complete aircrews and a group of maintenance technicians. A crew on a Sea King generally consists of two pilots, a tactical coordinator, and an airborne electronic sensor operator.

Briefing Guide: The briefing guide is a document the SAC will prepare for the aircrew prior to each mission. At the preflight briefing, the SAC will distribute a briefing guide to each crewmember and the contents will be briefed in detail. The briefing guide outlines the mission, tactical situation, communication plan and frequencies, force disposition and intended movement, weather and various other information.

Flying Pilot: The flying pilot is the pilot at the controls of the helo The flying pilot can be in either seat. Control will pass between pilots regularly throughout a mission and even on approach and landing. Generally at night, the flying pilot on approach will switch to become the non-flying pilot for landing.

FLYCO: FLYCO is the term used for flight control. This is somewhat of a misnomer, as this person does not control flight. FLYCO is the term used for the location, which on a CPF, is on the opposite side of the flight deck from the LSO compartment. It is also used to identify the person filling the role, which is a trained and qualified senior firefighter from the ship's company. When an airdet is not embarked, FLYCO will be the one controlling any flying operations but otherwise this person is responsible for lighting and safety, particularly with fires. In case of a crash on deck, FLYCO will assume control and direct the fire fighting efforts.

HHRSD: Helo Hauldown and Rapid Securing Device.

Howdah: The Howdah is another name for the LSO compartment.

Land/Launch, L/L, Lima Lima: These are code words for the radio frequency that the ship conducts its helicopter operations that have to do with operating around the ship. Examples where L/L would be used is for launch and recovery, and flight deck operations such as slinging, hoisting or in flight refuelling. Generally, tactical operations will be conducted on different frequencies once the helo is away from the ship. These tactical frequencies might be referred to as Primary, Secondary or something else. The tactical frequencies change regularly while L/L will generally stay the same.

Landing Safety Officer (LSO, Paddles): The LSO is a pilot trained and qualified to supervise and operate the flight deck and helo operations around the ship. If the LSO is not controlling the helo then control will generally rest with the SAC for operations away from the ship.

Maritime Helicopter Captain (MHC): The MHC is one of the pilots and is responsible for the safety of the helicopter and the crew. The MHC will make all decisions regarding operating the aircraft in a safe and effective manner. The MHC may also be the MHCC but not necessarily. The MHC may fulfill his or her duty from either seat of the aircraft and generally, crews alternate seats for training purposes and for variety. The co-pilot is qualified from the beginning to operate from either seat of the aircraft.

Maritime Helicopter Crew Commander (MHCC): The MHCC is the crewmember on board the helicopter responsible for the effective completion of the mission. This duty will either fall to one of the pilots or the TACCO. Generally, if one of the pilots is the MHCC then that pilot will also be the MHC.

Numbers: The numbers is the information on landing parameters that the ship passes to the helicopter. Specifically:

- Flying Course: The ship's speed and heading
- True Wind: The true wind speed and direction not relative to the ship. All directional information at sea is given in True rather than Magnetic. This parameter is called True Wind because it refers to the actual wind speed and direction. The fact that the direction is in true in this situation is coincidental.
- Relative Wind: The wind speed and direction calculated between the Flying Course and the True Wind.
- Altimeter setting: In inches of mercury

Each of these numbers is important individually to a pilot and also as a whole. There are various restrictions associated with each given parameter.

Officer of the Watch (OOW): The OOW is the Captain's representative controlling the ship on the Bridge. The OOW has specific but limited duties as assigned by the Captain. The level of responsibility and authority will be assigned individually by the Captain based on experience and trust. Ultimately the Captain is responsible for everything. Prior to most any helicopter operations, the OOW will seek the Captain's permission. This includes launch, recovery and most other operations.

Paddles: See LSO

Primary Frequency: See Land/Launch

Radhaz: Radhaz is short for Radiation Hazard. The Radhaz condition refers to the state of ionizing transmitters including high-powered radios and radars. Prior to helicopter operations within half a nautical mile of a Canadian Patrol Frigate, all Radhaz identified equipment must be secured. This is the responsibility of the Officer of the Watch.

RSD: Rapid Securing Device. Otherwise known as the bear trap.

Safe Single: Safe single engine speed is an airspeed calculated based on aircraft weight and outside air temperature. The helicopter cannot hover on a single engine and the safe single speed is an indication to the pilot of what minimum airspeed is required to maintain flight.

Secondary Frequency: See Land/Launch

Shipborne Air Controller (SAC): The SAC is the equivalent to an air traffic control for shipborne operations. SACs exercise various control over assets and provide information. When the helo is operating away from the ship it will remain in contact with the SAC for flight following and mission tasking.

Signals:

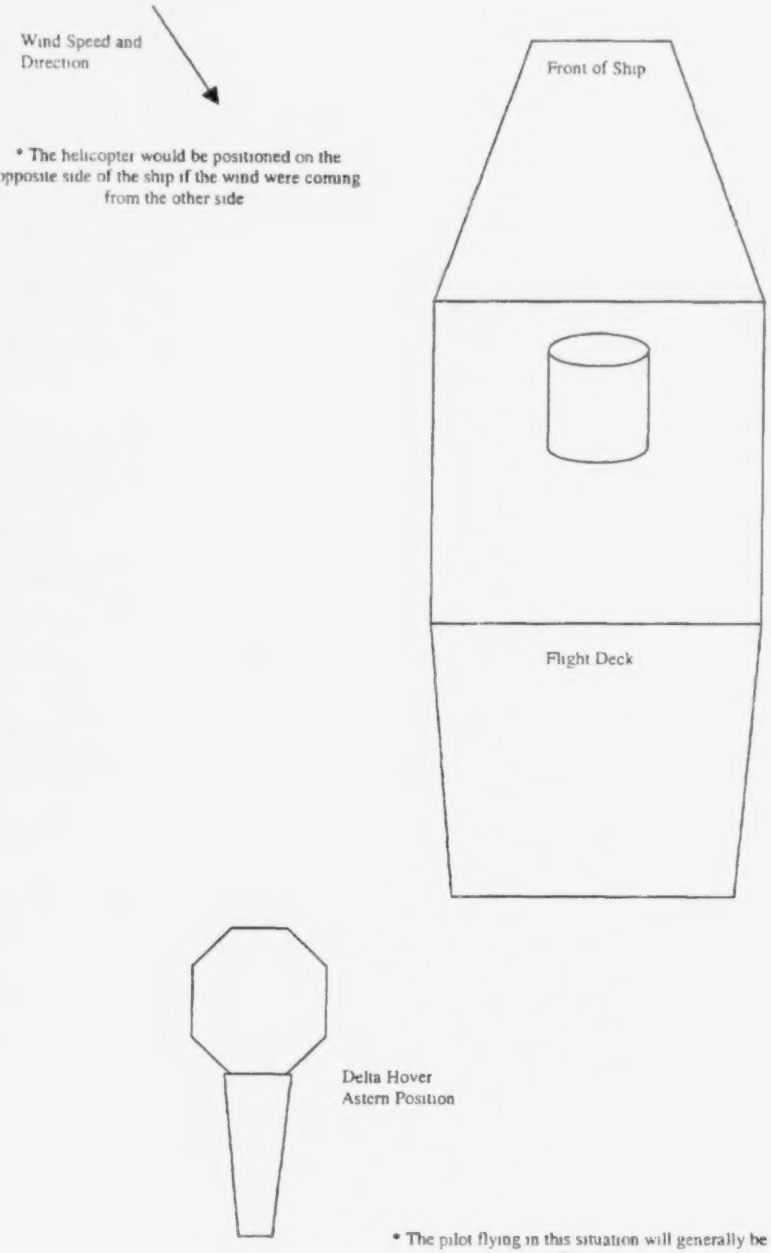
- Signal Charlie Cleardeck: Clearance to return for landing where there will be no RSD used
- Signal Charlie Freedeck: Clearance to return for landing where landing will be done using the RSD
- Signal Charlie Hauldown: Clearance to return for landing where landing will be done using the hauldown and RSD
- Signal Charlie Portable Bellmouth: Clearance to return for landing where the landing will be done using the portable bellmouth deck attachment and the hauldown, but no RSD
- Signal Charlie for Hoist Transfer: Clearance to return to the ship to conduct a hoist transfer
- Signal Charlie for Sling: Clearance to return to the ship to conduct a sling
- Signal Charlie for HIFR: Clearance to return to the ship to conduct a hot in-flight refuelling.
- Signal Charlie for Focsle Transfer: Clearance to return to the ship to conduct a hoist transfer to the focsle of the ship
- Signal Delta: Clearance to approach the ship and orbit at 200 feet and 80 knots doing standard right hand circuits. This will be given if the ship is not ready to recover the helo.
- Signal Delta Hover Astern: Clearance to approach the ship and enter a hover just astern and to the side of the ship. Which side depends on the relative wind. See attached graphic for further.

Tactical Coordinator (TACCO): The TACCO is the navigator who is responsible for the tactical employment of the aircraft towards mission accomplishment. The TACCO may or may not be the MHCC. The TACCO will operate the radios tactically but will pass control back to the pilots for any shipboard operations including launching and landing.

Trafficators: Signal lights controlled by FLYCO as a backup to radio communications. Three different colours, Green, Amber, and Red.

Wave Off: Executive signal given to helicopter at any time by any person to order the helo to cease whatever evolution being conducted and/or depart. The most common use will be during the landing phase if the helo misses the RSD. In this situation the helo will take off back to the high hover and confirm the order by repeating it over the radios.

Delta Hover Astern:



* The helicopter would be positioned on the opposite side of the ship if the wind were coming from the other side

* The pilot flying in this situation will generally be the pilot in the right seat and opposite if the helo were on the other side of the ship

ANNEX C

HIERARCHICAL DECOMPOSITION

ANNEX C – HIERARCHICAL DECOMPOSITION

GENERAL

Hierarchical decompositions are graphical representations of the logical relationships between the various functions and supervisory goals, which comprise a mission. Hierarchical decompositions are arranged both logically and chronologically, and are typically developed for top-, first- and second-level functions from the mission analysis

TOP-LEVEL FUNCTIONS

Top-level functions are used to represent the overall mission as a series of individual elements performed either alone or in conjunction with other mission elements. Each top-level function, also referred to as a mission section, is typically associated with a specific role.

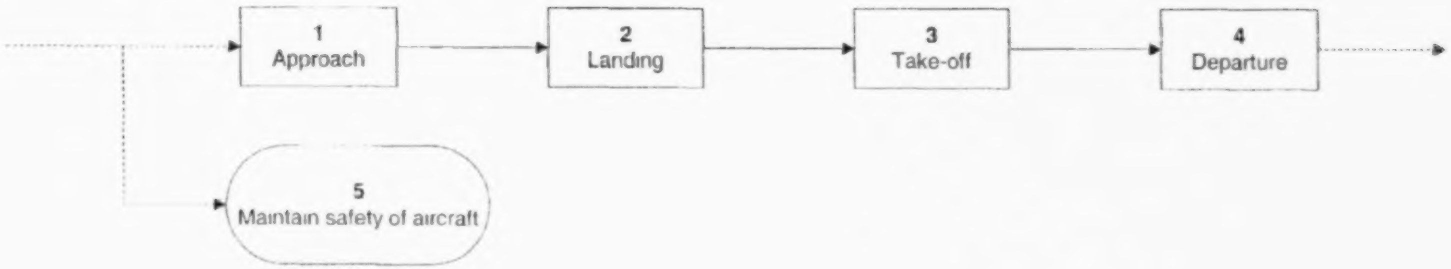
FIRST-LEVEL FUNCTIONS

Each top-level function is decomposed into one or more first-level functions, which define the activities involved in completing the higher level function. First-level functions, also referred to as mission segments, are still general in nature, and are included according to the tactical or physical requirements dictated by the mission scenario. As an example, the top-level function "Landing" decomposes into "Day Freedeck Landing", "Day Hauldown Landing", and "Night Freedeck Landing".

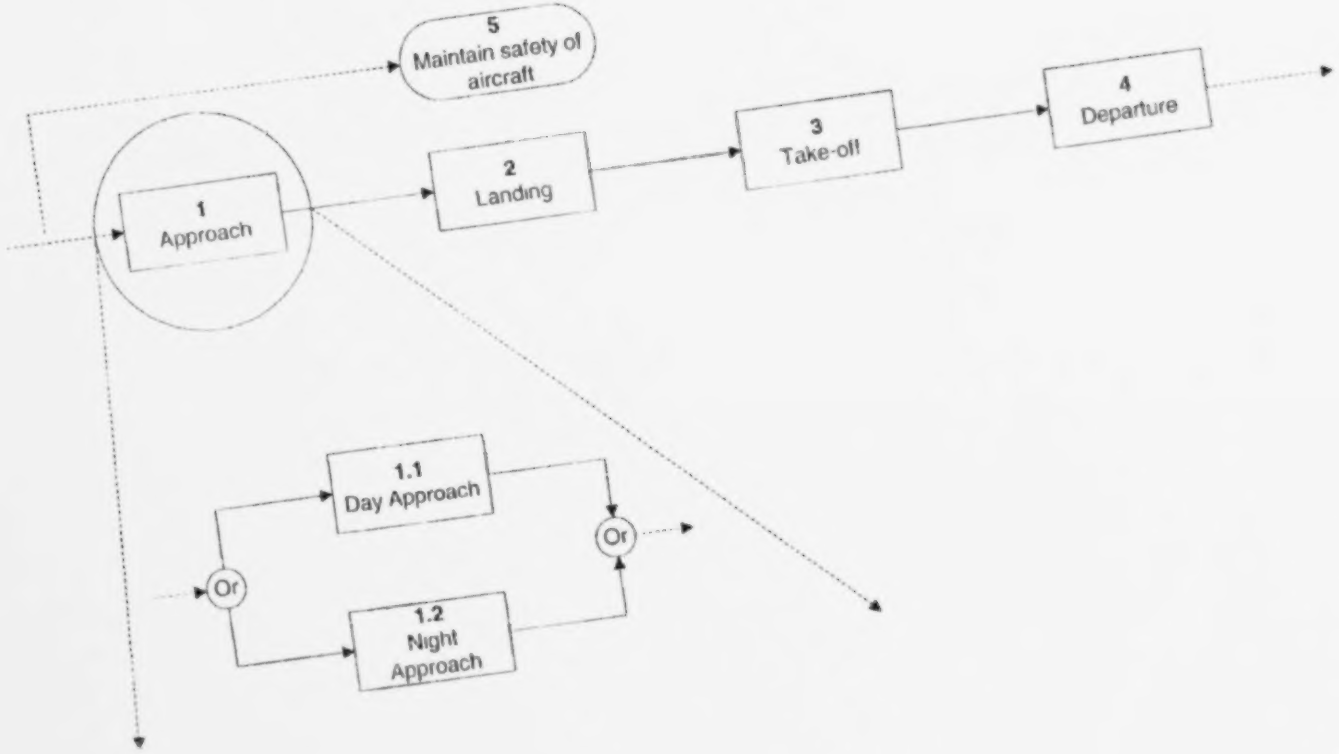
SECOND-LEVEL FUNCTIONS

First-level functions are decomposed into one or more second-level functions. Typically, second-level functions are identified for which measurable performance requirements can be analyzed. For example, the first-level function "Day Freedeck Landing" referred to above decomposes into second-level functions such as "Prepare to Land Helo", "Position Helo for Landing", and "Land Helo". In all cases, the performance of the combined human-machine system is measurable against pre-defined standards (such as time, accuracy, and workload). Second-level functions may involve multiple operators and equipment subsystems.

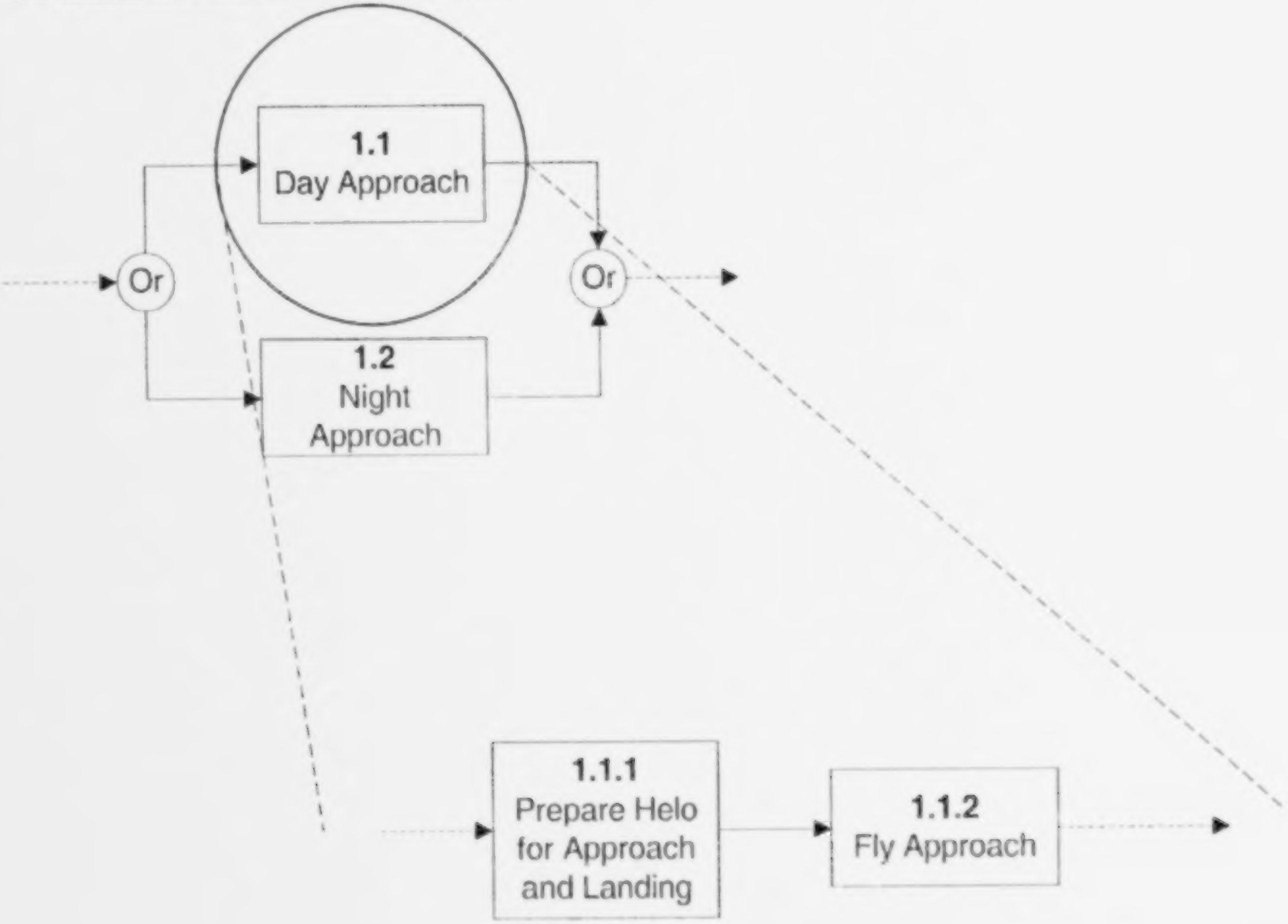
Top Level


1
Approach
2
Landing
3
Take-off
4
Departure
5
Maintain safety of aircraft

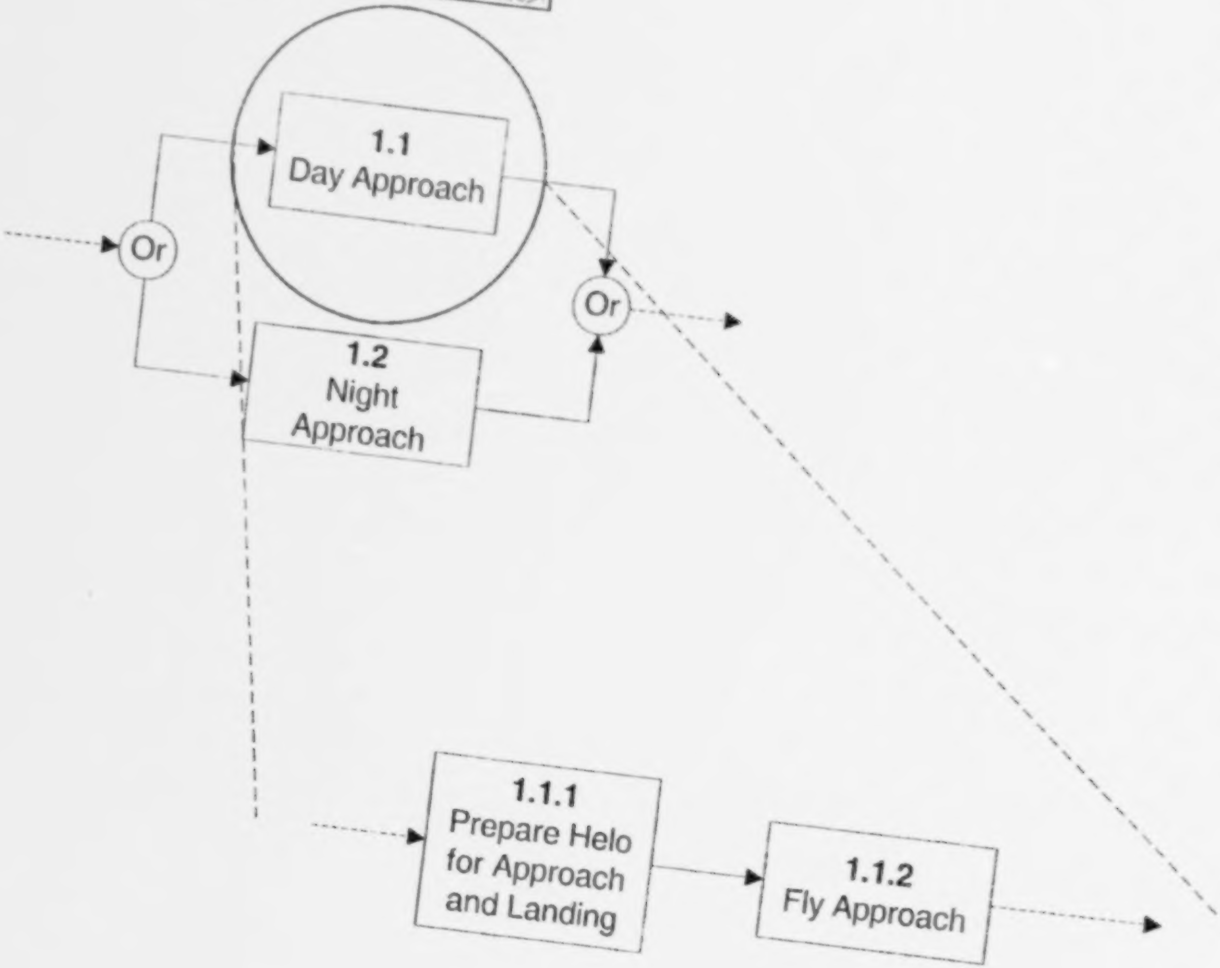
First Level - Approach



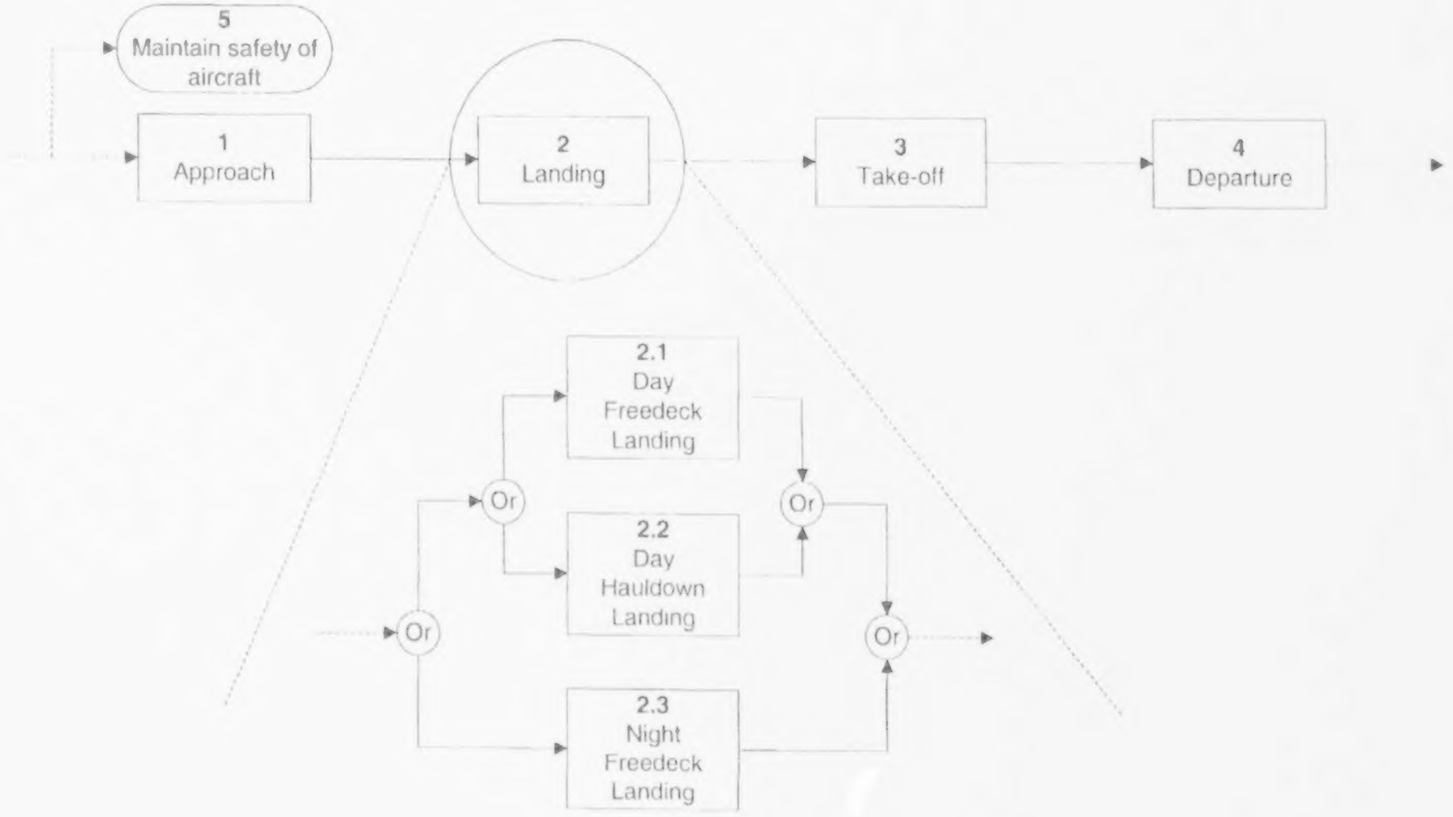
Second Level - Day Approach



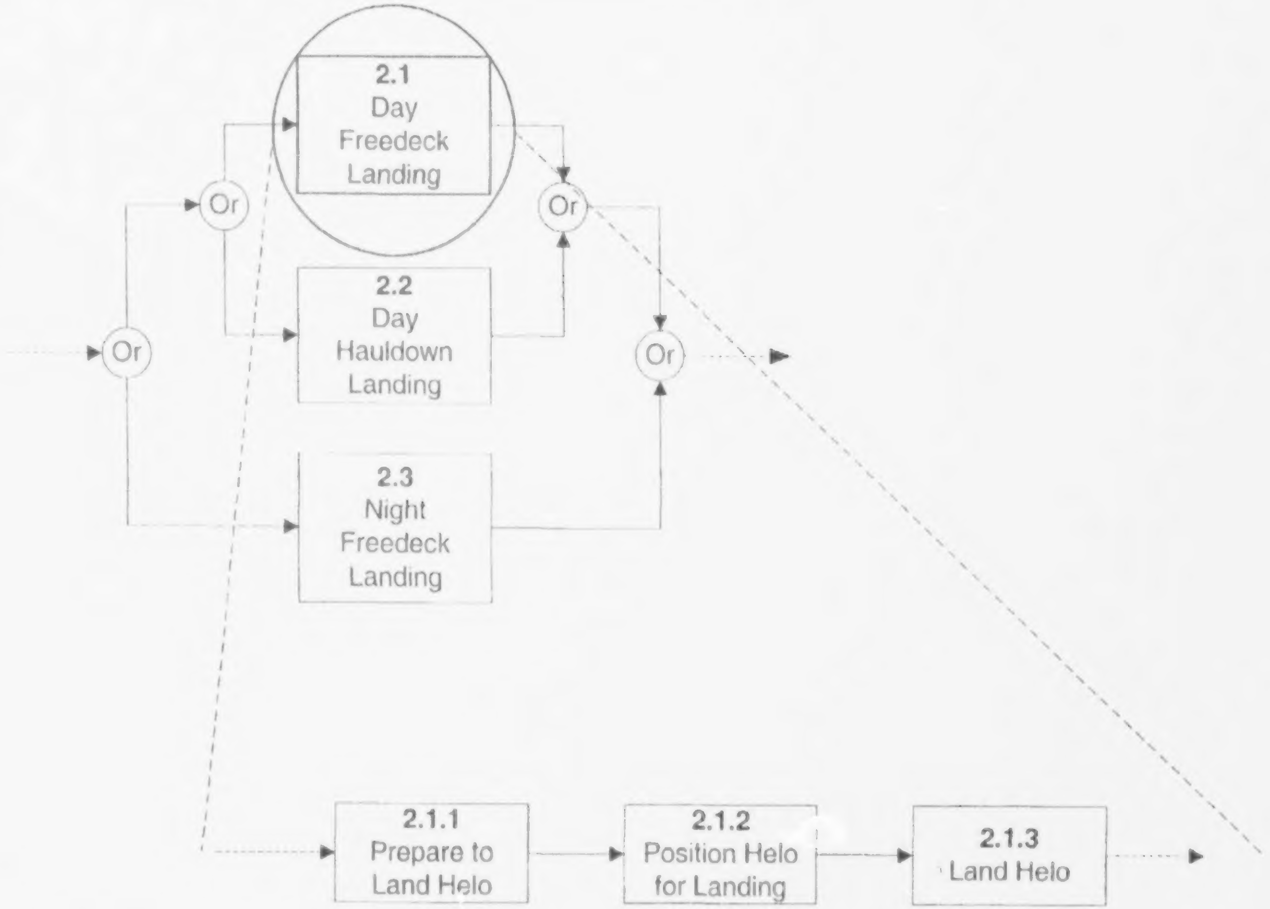
Second Level - Day Approach



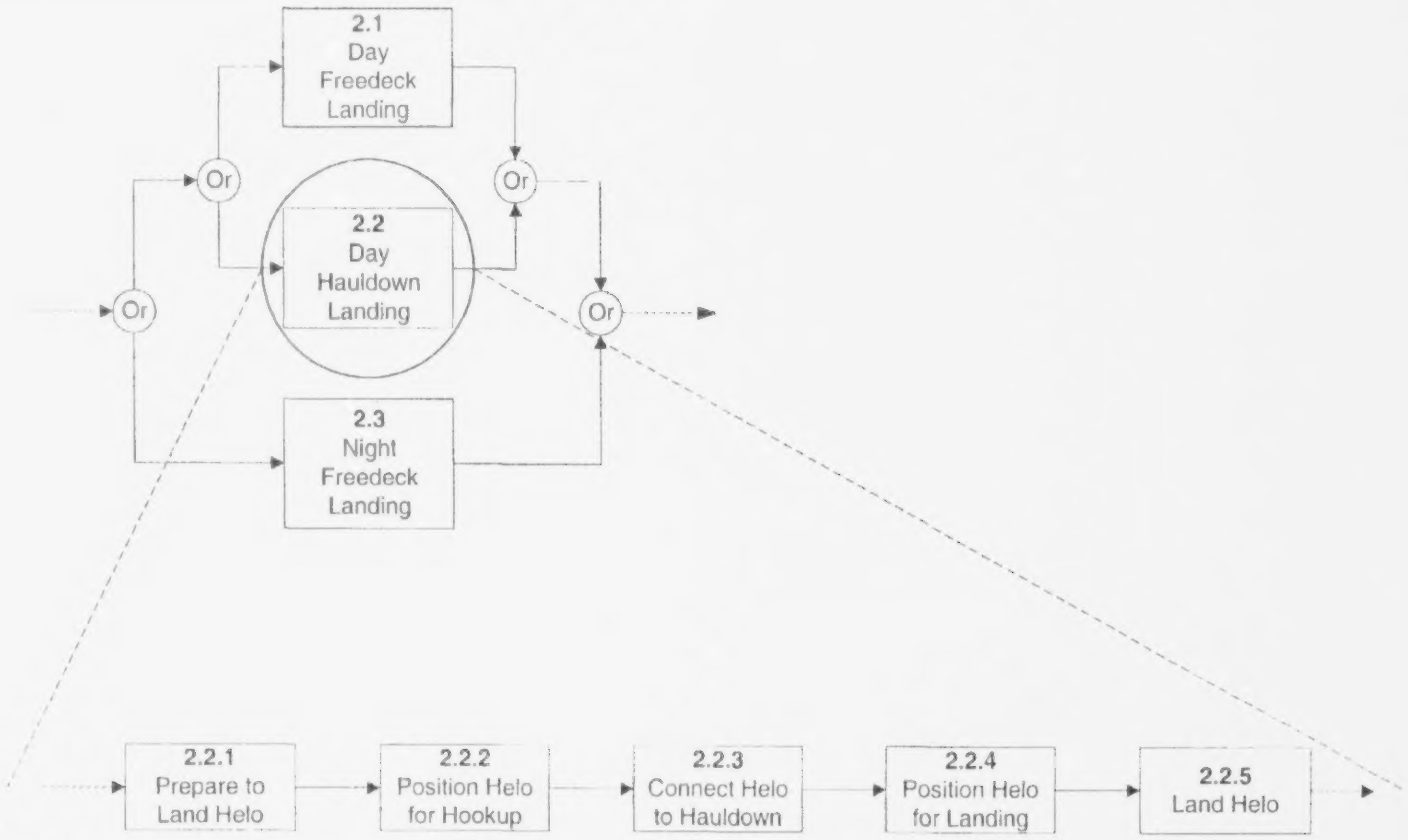
First Level - Landing



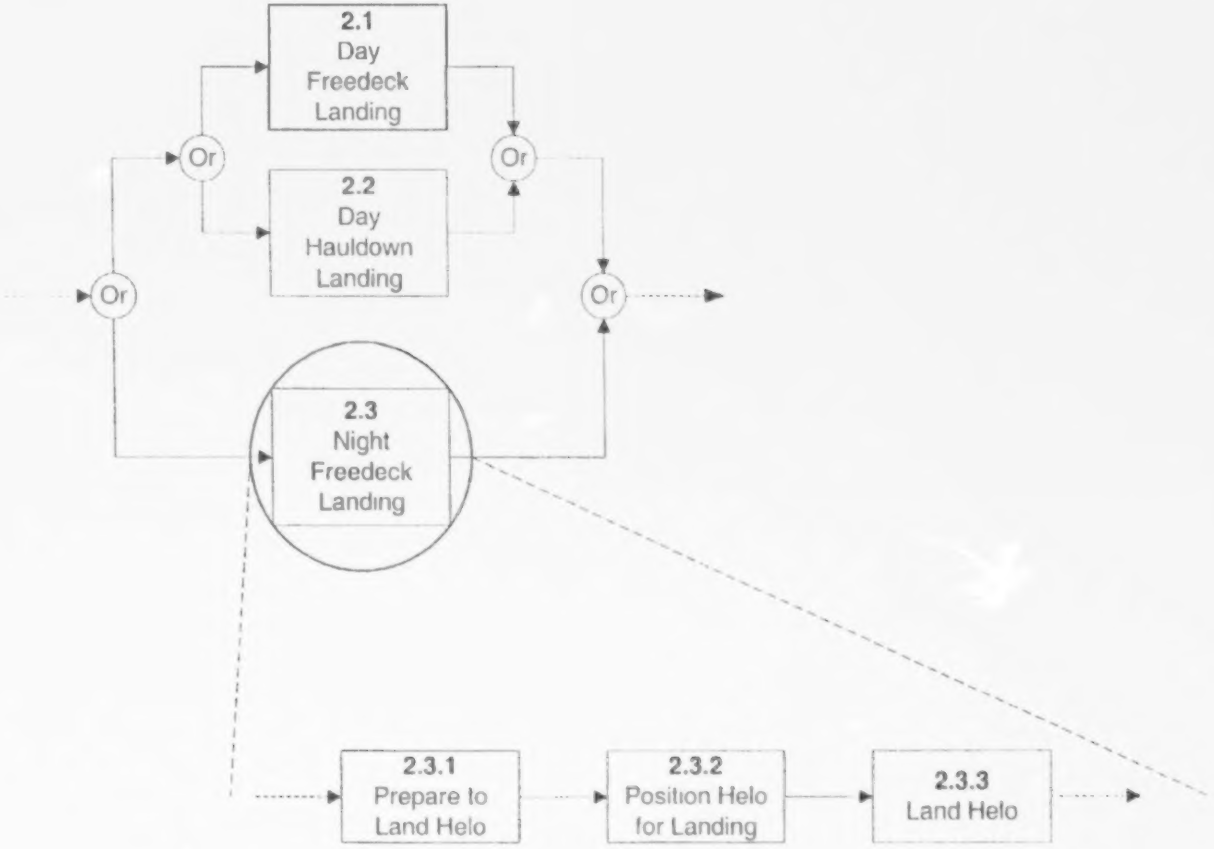
Second Level - Landing, Day Freedeck



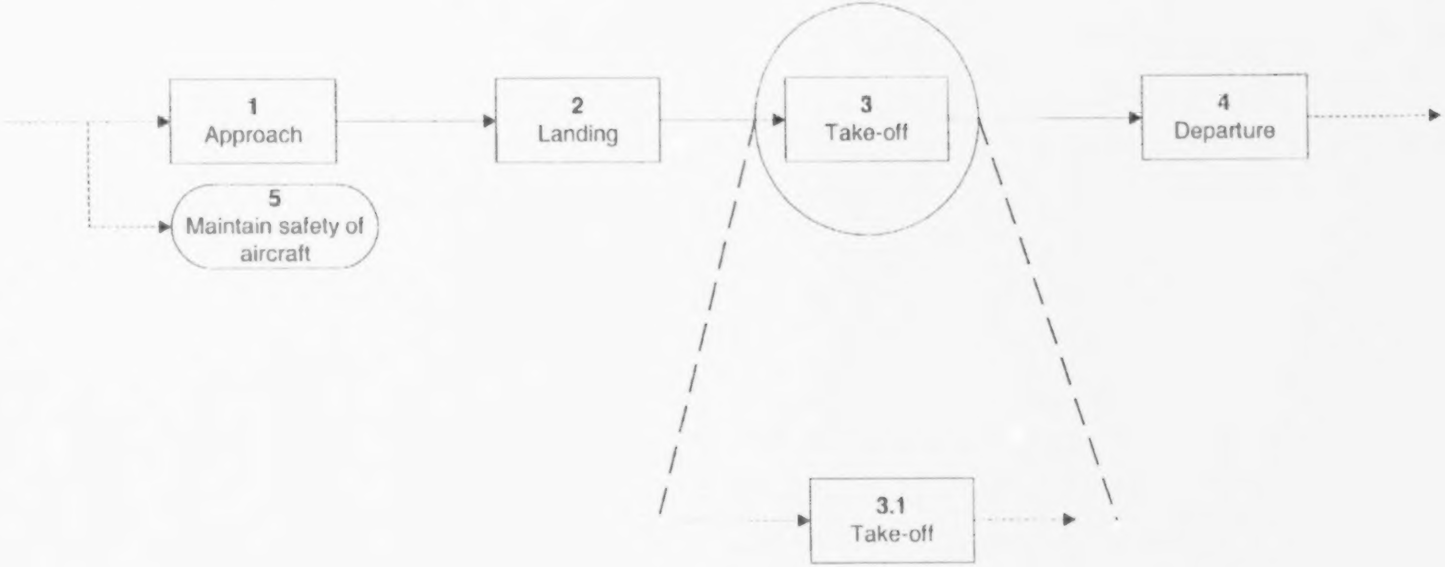
Second Level - Landing, Day Hauldown



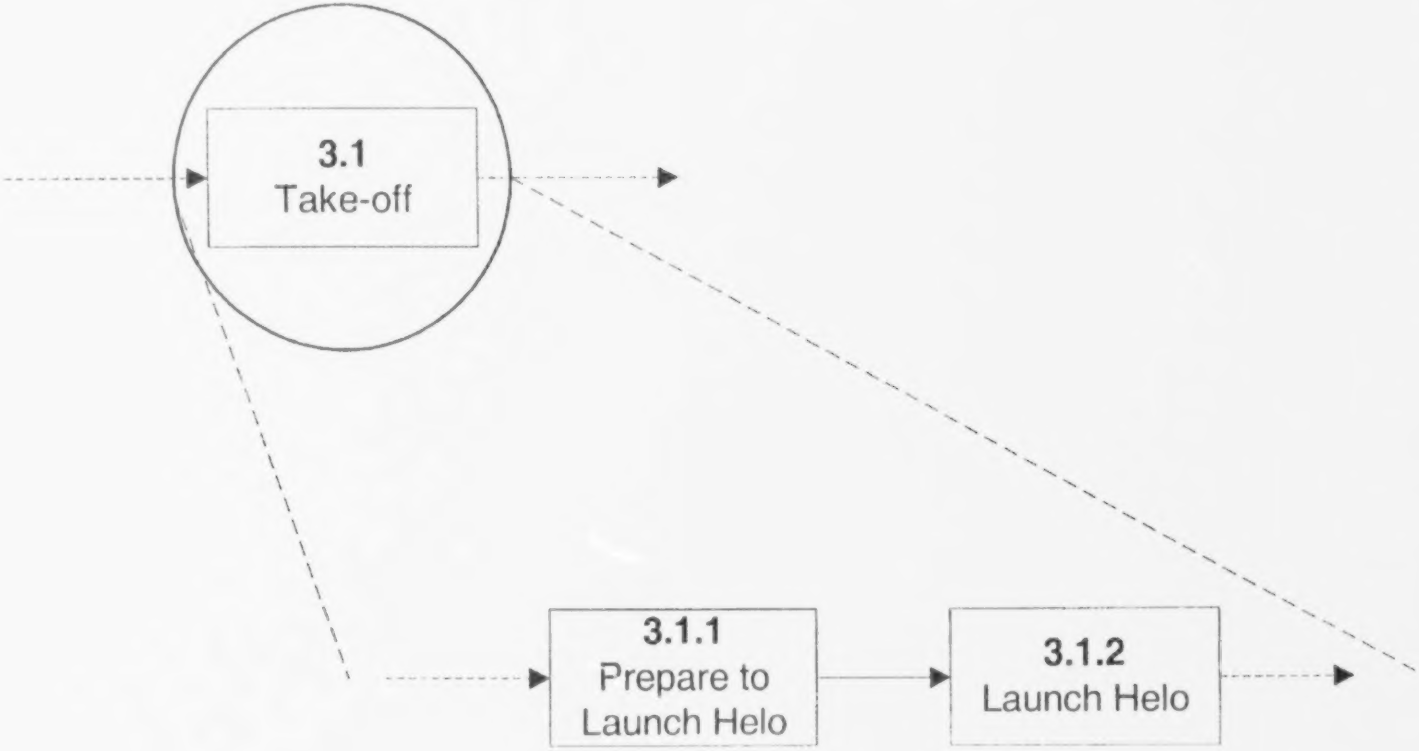
Second Level - Landing, Night Freedeck



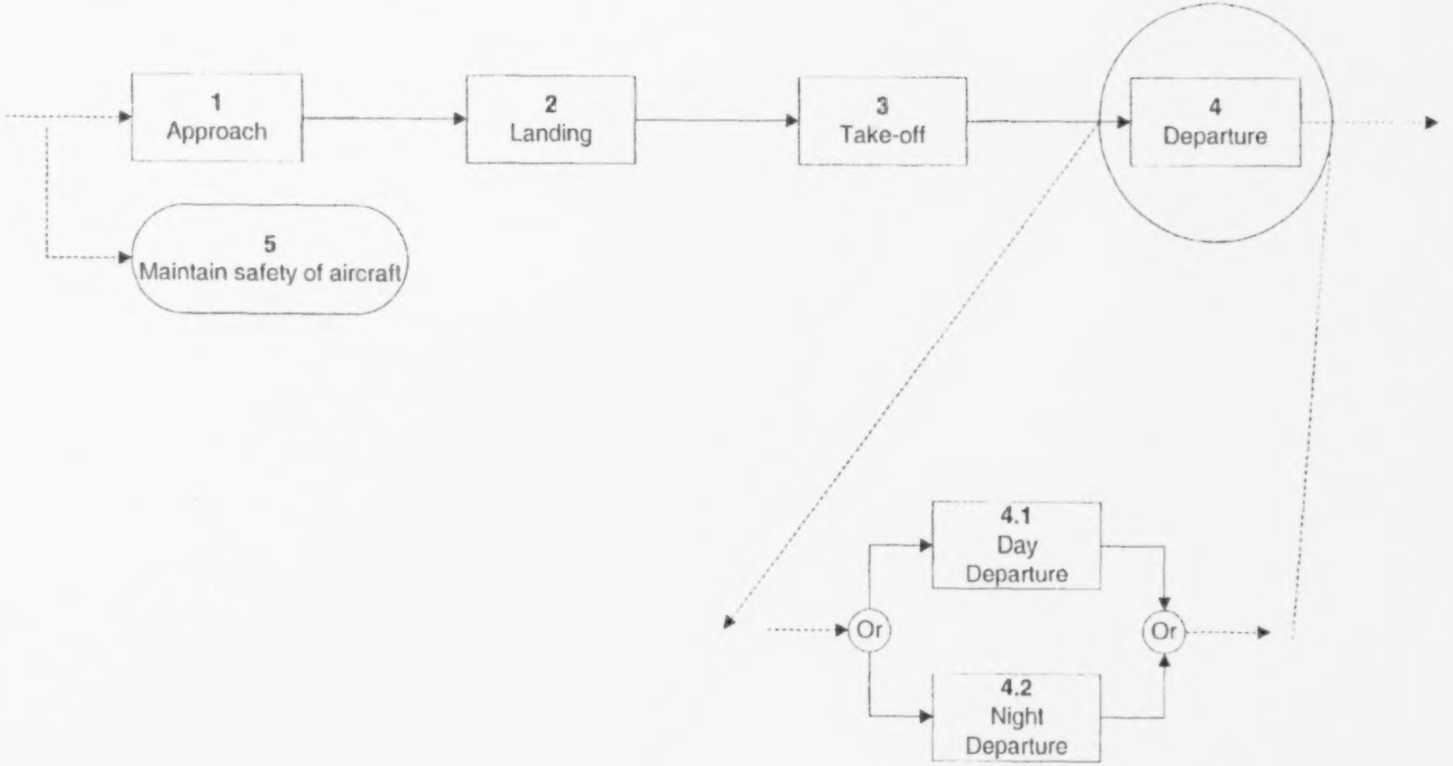
First Level - Take-off



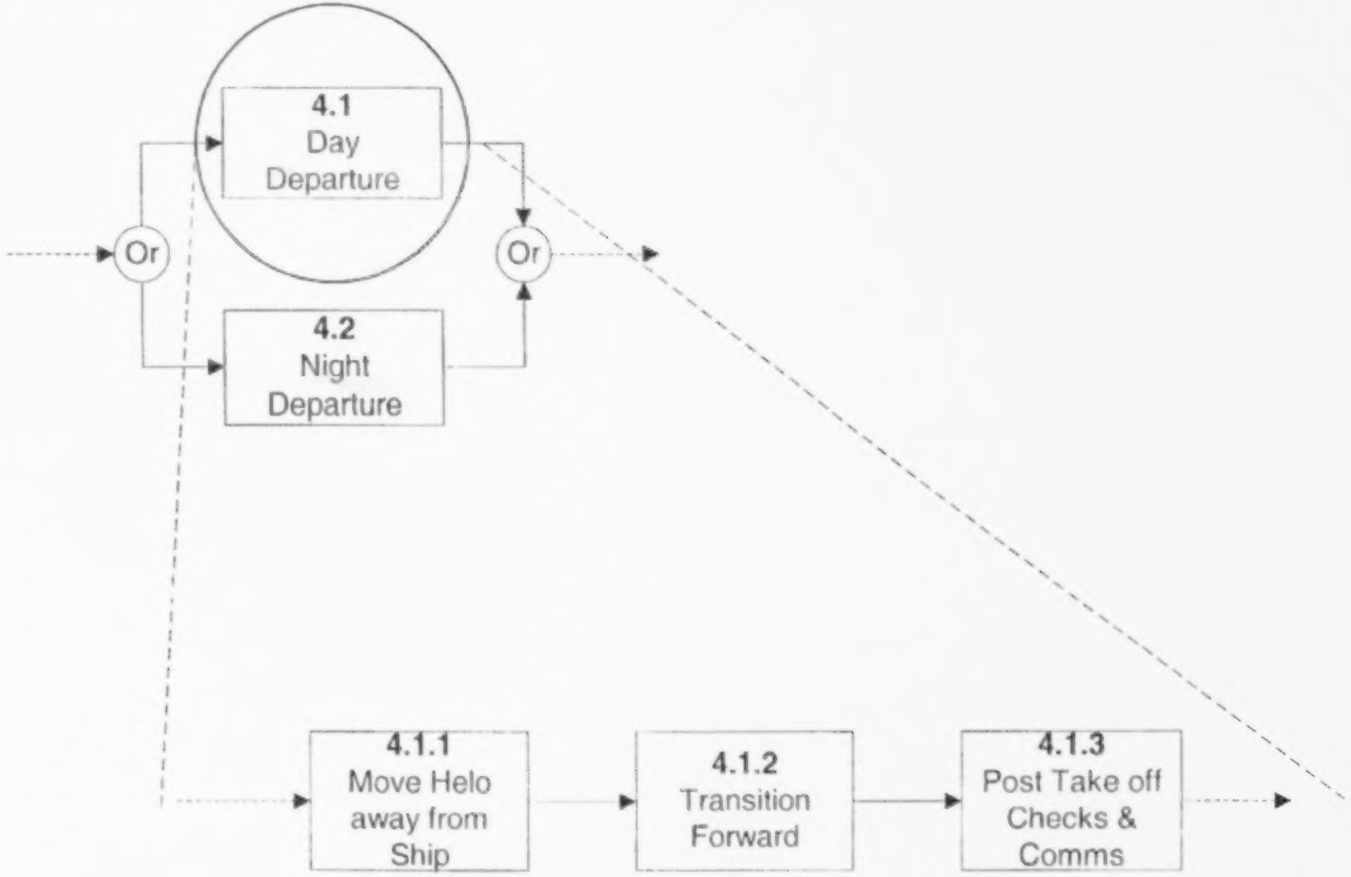
Second Level - Take-off



First Level - Departure



Second Level - Day Departure



ANNEX D

INVENTORY OF GOALS

ANNEX D - INVENTORY OF GOALS

	Source Goal
1 Approach	
1 1 Day Approach	
1 1 1 Prepare Helo for Approach and Landing	
1 1 1 1 Complete Pre-Landing Checks	
1.1.1.1 1 Complete pre landing checklist	1.1.1.1 1
1 1 1.1.2 Report that pre landing checks are complete	1.1.1.1.2
1 1 1 1 3 Request pre landing checklist be completed	1.1.1.1 3
1.1.1 1.4 Receive request to complete pre landing checklist	1.2.1.2.17
1 1.1.1.5 Receive report that pre landing checklist is complete	1 1 1 1 5
1 1 1.1.6 Monitor Radios	1 1.1 1.6
1 1.1.1.7 Maintain desired condition of flight	1.1.1.1.7
1 1 1 1.8 Determine most likely flying course, wind speed, and direction	1.1 1.1.8
1 1 1 2 Communicate with Ship	
1 1.1.2 1 Receives numbers for recovery from TACCO	1 1 1 2 1
1 1.1.2.2 Assess numbers as passed by SAC via TACCO	1 1 1.2.2
1 1.1.2 3 Accept numbers for recovery	1.1 1.2 3
1 1 1 2.4 Receives clearance to close ship from TACCO	1.1 1 2 4
1 1.1 2 5 Acknowledge TACCO's clearance to close ship	1.1 1 2 5
1.1.1.2 6 Receive control of radios for landing from TACCO	1 1.1 2 6
1 1 1 2 7 Take control of radios	1 1 1.2 7
1 1 1 2 8 Receive acknowledgement from TACCO	1 2 1 2 8
1 1 1 2 9 Acknowledge SAC's control passage to LSO	1 1 1 2.5
1.1 1 2 10 Monitor radios	1 1 1 1.6
1.1 1.2 11 Call Paddles for control	1 1 1 2.11
1.1.1 2 12 Receive clearance from Paddles to delta hover astern	1 1 1 2.12
1.1 1 2 13 Acknowledge Paddle's clearance to delta hover astern	1 1 1 2.5
1.1 1 2 14 Receive from SAC to call Paddles for control	1 1 1 2 1
1 1.1.2 15 Request TACCO to transmit intentions to close to ship	1 1 1 2 15
1 1.1 2 16 Request frequency change to L/L freq	1 1.1.1.3
1.1.1.2 17 Receive request to change to L/L freq	1.2.1 2.17
1 1.1.2 18 Change radio to L/L freq	1 1 1.2.18
1 1.1 2 19 Report change to L/L freq	1 1 1.2.19
1 1 1.2 20 Receive report on freq change	1 1 1 1 5
1.1.1 3 Plan Approach	
1.1.1 3 1 Decide on approach plan	1 1.1.3.1
1 1.1.3 2 Brief crew on approach plan	1.1.1.3.2

ANNEX D - INVENTORY OF GOALS

	Source Goal
1.1.1.3.3 Sight ship	1.1.1.3.3
1.1.1.3.4 Observe trafficators are amber	1.1.1.3.4
1.1.1.3.5 Receive briefing on approach plan	1.2.1.3.5
1.1.1.4 Complete Panel Checklist	
1.1.1.4.1 Call for panel checklist to be completed	1.1.1.1.3
1.1.1.4.2 Receive call to complete panel checklist	1.2.1.2.17
1.1.1.4.3 Acknowledge request to complete panel checklist	1.1.1.2.5
1.1.1.4.4 Receive acknowledgement to complete panel checklist	1.2.1.2.8
1.1.1.4.5 Check tail wheel is locked	1.1.1.4.5
1.1.1.4.6 Check brakes are set	1.1.1.4.6
1.1.1.4.7 Call AESOP for sonar check	1.1.1.4.7
1.1.1.4.8 Receive confirmation from AESOP that sonar is "Seated and Sighted	1.1.1.4.8
1.1.1.4.9 Check throttles set to full	1.1.1.4.9
1.1.1.4.10 Inform AESOP winch to be lowered	1.1.1.4.10
1.1.1.4.11 Receives call from AESOP that fingers are clear of the winch	1.1.1.4.11
1.1.1.4.12 Lower winch and verifies light illuminated on haul down panel	1.1.1.4.12
1.1.1.4.13 Verify tail probe is up	1.1.1.4.13
1.1.1.4.14 Report that panel checklist is complete	1.1.1.1.2
1.1.1.4.15 Receives that panel checklist is complete	1.1.1.1.5
1.1.1.4.16 Acknowledges call that panel checklist was completed	1.1.1.2.5
1.1.1.4.17 Receive acknowledgement	1.2.1.2.8
1.1.2 Fly Approach	
1.1.2.1 Fly Approach	
1.1.2.1.1 Commence descent and deceleration	1.1.2.1.1
1.1.2.1.2 Call safe single engine speed	1.1.2.1.2
1.1.2.1.3 Establish hover in delta hover astern position	1.2.2.1.12
1.1.2.1.4 Receive safe single engine speed	1.1.2.1.4
1.1.2.1.5 Maintain hover	2.1.1.2.1
1.2 Night Approach	
1.2.1 Prepare Helo for Approach and Landing	
1.2.1.1 Complete Pre-Landing Checks	
1.2.1.1.1 Complete pre landing checklist	1.1.1.1.1
1.2.1.1.2 Report that pre landing checks are complete	1.1.1.1.2
1.2.1.1.3 Request pre landing checklist be completed	1.1.1.1.3
1.2.1.1.4 Receive request to complete pre landing checklist	1.2.1.2.17
1.2.1.1.5 Receive report that pre landing checklist is complete	1.1.1.1.5

	Source Goal
1.2.1 1.6 Monitor Radios	1 1.1.1.6
1.2 1 1.7 Maintain desired condition of flight	1.1.1.1.7
1.2 1.1.8 Determine most likely flying course, wind speed, and direction	1 1.1.1.8
1.2.1 2 Communicate with Ship	
1.2.1.2 1 Receive numbers for recovery from TACCO	1 1.1.2.1
1 2.1.2 2 Assess numbers as passed by SAC via TACCO	1 1.1.2 2
1.2.1.2.3 Accept numbers for recovery	1 1.1 2.3
1.2.1 2.4 Receive clearance to close ship from TACCO	1 1.1 2.4
1.2.1 2.5 Acknowledge TACCO's clearance to close ship	1 1.1.2.5
1.2 1.2.6 Receive control of radios from TACCO for landing	1 1.1 2.6
1 2 1.2 7 Take control of radios	1 1.1 2.7
1 2 1 2.8 Receive acknowledgement from TACCO	1.2.1 2.8
1 2.1.2.9 Acknowledge SAC's control passage to LSO	1.1.1 2.5
1.2.1.2 10 Monitor radios	
1.2.1.2 11 Call Paddles for control	1 1.1 2.11
1 2.1.2.12 Receive clearance from Paddles to delta hover astern	1.1 1 2.12
1.2 1 2 13 Acknowledge Paddle's clearance to delta hover astern	1.1.1 2.5
1 2 1 2.14 Receive instruction from SAC to call Paddles for control	1.1 1 2.1
1.2 1 2.15 Request TACCO transmit intentions to close to ship	1.1.1 2.15
1.2 1 2.16 Ask for frequency change to L/L freq	1.1 1 1.3
1.2 1.2.17 Receive request to change to L/L freq	1 2.1.2.17
1 2.1 2.18 Change radio to L/L freq	1.1.1 2 18
1 2 1 2.19 Report change to L/L freq	1.1.1 2.19
1 2.1.2.20 Receive report on freq change	1.1.1 1.5
1 2.1 3 Plan Approach	
1 2 1.3.1 Decide on approach plan	1 1.1.3 1
1 2 1.3.2 Brief crew on approach plan	1.1.1 3 2
1.2 1.3.3 Sight ship	1.1.1 3.3
1.2.1.3 4 Observe trafficators are amber	1 1 1 3.4
1 2.1.3 5 Receive briefing on approach plan	1.2.1 3.5
1 2 1 4 Complete Panel Checklist	
1.2.1 4 1 Calls to complete panel checklist	1.1.1 1.3
1.2.1 4 2 Receive call to complete panel checklist	1.2.1.2.17
1.2.1 4 3 Acknowledge request to complete panel checklist	1.1.1.2.5
1.2.1.4 4 Receive acknowledgement to request to complete panel checklist	1 2.1.2.8
1.2.1.4 5 Check tail wheel is locked	1 1 1.4.5

ANNEX D - INVENTORY OF GOALS

	Source Goal
1.2.1.4.6 Check brakes are set	1.1.1.4.6
1.2.1.4.7 Call AESOP for sonar check	1.1.1.4.7
1.2.1.4.8 Receive confirmation from AESOP that sonar is "Seated and Sighted	1.1.1.4.8
1.2.1.4.9 Check throttles set to full	1.1.1.4.9
1.2.1.4.10 Informs AESOP winch to be lowered	1.1.1.4.10
1.2.1.4.11 Receive call from AESOP that fingers are clear of the winch	1.1.1.4.11
1.2.1.4.12 Lower winch and verify light illuminated on haul down panel	1.1.1.4.12
1.2.1.4.13 Verify tail probe is up	1.1.1.4.13
1.2.1.4.14 Report that panel checklist is complete	1.1.1.1.2
1.2.1.4.15 Receives that panel checklist is complete	1.1.1.1.5
1.2.1.4.16 Acknowledge Panel Checklist Completed	1.1.1.2.5
1.2.1.4.17 Receives acknowledgement	1.1.1.2.5
1.2.2 Fly Approach	
1.2.2.1 Fly Approach	
1.2.2.1.1 Pass controls to NFP	1.2.2.1.1
1.2.2.1.2 Position helo at FAF	1.2.2.1.2
1.2.2.1.3 Observe two mile lighting on ship	1.2.2.1.3
1.2.2.1.4 Initiate descent and deceleration	1.1.2.1.1
1.2.2.1.5 Fly Pilot Monitored Approach	1.2.2.1.5
1.2.2.1.6 Monitor Pilot Monitored Approach	1.2.2.1.6
1.2.2.1.7 Call for one mile lighting	1.1.1.1.3
1.2.2.1.8 Acknowledge call for one mile lighting	1.1.1.2.5
1.2.2.1.9 Switch lights to one mile lighting	1.2.2.1.9
1.2.2.1.10 Observe change in flight deck lighting to one mile lighting	1.2.2.1.10
1.2.2.1.11 Call safe single engine speed	1.1.2.1.2
1.2.2.1.12 Establish hover in delta hover astern position	1.2.2.1.12
1.2.2.1.13 Take control of helo from FP	1.2.2.1.13
1.2.2.1.14 Acknowledge NFP taking controls	1.1.1.2.5
1.2.2.1.15 Watch flight instruments	1.2.2.1.15
1.2.2.1.16 Call "Cease reporting"	1.2.2.1.16
1.2.2.1.18 Receive call to cease reporting	1.2.2.1.18
1.3 Troubleshoot Failures during Approach	
1.3.1 Troubleshoot ASE Failure	
1.3.1.1 Troubleshoot ASE Failure	
1.3.1.1.1 Sense control malfunction	1.3.1.1.1
1.3.1.1.2 Maintain control of helo	1.1.1.1.7

ANNEX D - INVENTORY OF GOALS

	Source Goal
1.3 1 1.3 Call for full power both	1 3.1.1 3
1.3 1 1.4 Receive call for full power both	1 3.1.1 4
1 3 1 1.5 Set speed selectors to full power	1 1.1.4 9
1 3 1.1.6 Confirm full power both	1 3.1.1.6
1 3.1.1.7 Receive confirmation of full power both	1 3.1.1 7
1.3.1 1.8 Overshoot approach	1.3.1.1.8
1.3.1.1.10 Maintain safe regime of flight	1 1 1.1.7
1.3.1 1.11 Explain indications to crew	1.3 1.1 11
1.3.1.1.12 Receive briefing on malfunction indications	1.3 1 1.12
1.3.1 1 13 Request NFP to troubleshoot failure	1.1 1 1 3
1.3.1 1 14 Receive request to troubleshoot failure	1.2.1.2.17
1.3.1 1.15 Acknowledge request to troubleshoot	1 1 1.2.5
1 3 1 1.16 Receive acknowledgement	1.2.1 2 8
1 3 1 1.17 Inform crew on hover indicator status	1.3 1.1 17
1.3 1.1 18 Receive hover indicator status	1 3 1 1.18
1 3 1.1 19 Observe circuit breaker status	1.3.1 1 19
1 3.1.1 20 Report circuit breaker status	1 3.1 1.20
1 3.1.1.21 Receive circuit breaker status	1 3 1 1 21
1 3.1.1.22 Order ASE reset	1 1 1 1.3
1.3.1.1 23 Receive order to reset ASE	1 2.1 2.17
1.3.1.1 24 Depress ASE button	1.3 1 1.24
1.3.1.1 25 Inform crew ASE failed to reset	1 3 1 1.25
1.3.1.1 26 Receive report on ASE reset failure	1 1.1 1.5
1.3.1.1.27 Inform LSO of situation and requests constant tension hauldown	1.3 1.1.27
1.3.1.1.28 Receive acknowledgement from LSO	2 1.2.8
1 3.1.1 29 Receive order to move to and remain in delta	2 1 2 1 1
1 3 1.1.30 Fly aircraft to delta hover astern	
1.3.1.1.31 Maintain aircraft in delta hover astern	1 1 1.1.7
1.3.1 1 32 Brief crew on situation and plan for recovery	1.1.1.3 2
1.3 1 1.33 Receive briefing on situation and recovery plan	1 2 1.3.5
1.3.1 1.34 Re-confirm numbers for recovery with LSO	1 3 1.1.34
1.3 1 1.35 Receive acknowledgement from LSO	1 2.1.2.8
1.3 1 1 36 Switch hover indicator to "A" mode	1 3 1.1.36

2 Landing
  2.1 Day Freedeck Landing
    2.1 1 Prepare to Land Helo

ANNEX D - INVENTORY OF GOALS

	Source Goal
2.1.1 1 Verify Flight Deck Status	
2.1.1.1.1 Look over ship for safety and readiness	2 1 1.1.1
2.1.1 2 Maintain Hover Relative to Ship	
2.1.1 2.1 Maintain hover relative to ship	2 1 1.2.1
2.1.1.3 Wait for Clearance from LSO	
2 1 2 Position Helo for Landing	
2.1.2.1 Receive clearance from LSO	
2 1 2.1 1 Receive Signal Charlie from LSO	2 1.2 1.1
2 1.2.1 2 Observe trafficators switch to green	1.1.1.3 4
2 1.2 1 3 Acknowledge Signal Charlie clearance from LSO	1 1 1.2.5
2.1.2 2 Fly Helo Forward Abeam Spot	
2.1.2.2 1 Fly forward abeam spot	2.1 2.2.1
2 1.2.3 Lower Landing Gear	
2 1.2 3.1 Lower landing gear	2 1.2.3 1
2 1 2 3.2 Check left hand bug light	2 1.2 3 2
2 1 2 3.3 Confirm left hand bug light is illuminated	2 1.2.3 3
2 1 2 3.4 Check right hand bug light	2 1.2.3 2
2 1 2 3.5 Confirm right hand bug light is illuminated	2 1.2.3.5
2 1 2 3.6 Check panel and gear handle lights to confirm landing gear down	2 1.2.3 6
2 1 2 3.7 Call gear down and locked	2 1 2 3 7
2 1 2 3 8 Acknowledge call that landing gear is down and locked	1 1.1.2 5
2 1 2 3.9 Receive confirmation of left hand bug light	2 1.2 3 9
2.1 2.3.10 Receive confirmation of right hand bug light	2 1 2 3 9
2 1 2.3.11 Receive gear down and locked call	2 1 2 3.11
2 1 2.3.12 Receive acknowledgement that gear is down and locked	1 2.1 2 8
2 1.2 4 Move Helo into High Hover	
2 1 2.4.1 Fly helo into High Hover position	2 1 2.4 1
2 1.2.4.2 Provide fore and aft conning advisory	2 1 2.4 2
2 1.2.4.3 Wait for steady deck	2 1 2 4 3
2.1.2.4.4 Maintain hover relative to ship	2 1 1.2 1
2.1.2 4.5 Observe trafficators switch to amber	1 1 1.3 4
2.1.2.4.6 Guard throttle	2.1 2 4 6
2.1 2 5 Monitor Position of Helo for Landing	
2.1.2.5.1 Watch aircraft position for landing	2 1.2 5 1
2 1 3 Land Helo	

ANNEX D - INVENTORY OF GOALS

	Source Goal
2.1.3.1 Fly Helo to Low Hover	
2.1.3.1.1 Fly to Low Hover	2.1.3.1.1
2.1.3.1.2 Provide fore and aft conning advisory	2.1.2.4.2
2.1.3.2 Position Helo and Await the Deck	
2.1.3.2.1 Position helo and await the deck	2.1.2.4.3
2.1.3.2.2 Provide fore and aft conning advisory	2.1.2.4.2
2.1.3.2.3 Maintain hover relative to ship	2.1.1.2.1
2.1.3.2.4 Receive conning advisory	2.1.3.2.4
2.1.3.3 Land Helo	
2.1.3.3.1 Call ready to land	2.1.3.3.1
2.1.3.3.2 Receive conning from LSO	2.1.3.3.2
2.1.3.3.3 Receive executive to land helo	2.1.3.3.3
2.1.3.3.4 Observe trafficators switch to green	1.1.1.3.4
2.1.3.3.5 Land helo	2.1.3.3.5
2.1.3.3.6 Receive call that helo is trapped and to lower tail probe	2.1.3.3.6
2.1.3.3.7 Lower tail probe	2.1.3.3.7
2.1.3.3.8 Receive call from LSO saying tail probe is down	2.1.3.3.8
2.1.3.3.9 Depress ASE switch	2.1.3.3.9
2.1.3.3.10 Observe trafficators are turned off	2.1.3.3.10
2.1.3.3.11 Verify tail probe light	2.1.3.3.7
2.1.3.4 Maintain Position of Helo for Landing	
2.1.3.4.1 Maintain helo position until landing can be achieved	1.1.1.1.7
2.2 Day Hauldown Landing	
2.2.1 Prepare to Land Helo	
2.2.1.1 Verify Flight Deck Status	
2.2.1.1.1 Look over ship for safety and readiness	2.1.1.1.1
2.2.1.2 Maintain Hover Relative to Ship	
2.2.1.2.1 Maintain hover relative to ship	2.1.1.2.1
2.2.1.3 Wait for Clearance from LSO	
2.2.1.3.1 Wait for clearance from LSO	
2.2.2 Position Helo for Hookup	
2.2.2.1 Receive Clearance from LSO	
2.2.2.1.1 LSO calls helo with Signal Charlie	2.1.2.1.1
2.2.2.1.2 Observe trafficators switch to green	1.1.1.3.4
2.2.2.1.3 Acknowledge Signal Charlie	1.1.1.2.5
2.2.2.2 Fly Helo Forward Abeam Spot	

ANNEX D - INVENTORY OF GOALS

	Source Goal
2 2.2.2.1 Fly forward abeam spot	2.1.2 2 1
2.2.2.3 Lower Landing Gear	
2.2 2.3.1 Lower landing gear	2.1.2 3 1
2.2.2 3.2 Check left hand bug light	2.1 2 3.2
2 2 2.3.3 Confirm left hand bug light illuminated	2.1.2 3.3
2.2.2.3.4 Verify right hand bug light	2.1 2 3.2
2 2.2.3.5 Confirm right hand bug light illuminated	2.1 2.3.5
2 2 2.3 6 Check panel and gear handle lights to confirm landing gear down	2 1.2 3.6
2.2.2 3.7 Confirm gear down and locked	2 1 2.3.7
2.2.2 3.8 Acknowledge call that landing gear is down and locked	1 1 1 2 5
2.2.2 3.9 Receive confirmation of left hand bug light	2.1 2 3.9
2.2.2 3.10 Receive confirmation of right hand bug light	2 1 2 3.9
2 2.2 3.12 Receives gear down and locked call	2 1 2.3.11
2 2.2.3.13 Receive acknowledgement	1 2.1 2.8
2.2.2.4 Move Helo into High Hover	
2 2 2.4.1 Fly to hook-up position	2 2 2.4.1
2.2.2 4 2 Provide fore and aft conning advisory	2 1 2 4.2
2.2.2 4 3 Maintain hover relative to ship in hook-up position	2.1 1 2.1
2 2.2.5 Supervise Preparation of Helo for Landing	
2.2.2.5 1 Observe and listen to crew actions for preparation of landing	2 2 2 5.1
2.2 3 Connect Helo to Hauldown	
2 2.3.1 Connect Helo to Hauldown	
2.2 3 1 1 Lower messenger	2 2 3 1.1
2.2.3.1 2 Receive call from LSO to stop lowering the messenger	2 2 3 1 2
2.2 3 1 3 Observe trafficators switch to amber	1.1 1 3.4
2 2 3 1 4 Stop lowering the messenger	2.2 3 1 4
2.2.3 1 5 Observe deck crew moving under the helo	2 2.3 1.5
2.2.3.1.6 Receive call from LSO to raise the messenger	2 2 3 1 6
2 2.3.1.7 Observe trafficators switch to green	1 1.1 3 4
2 2.3.1.8 Raise the messenger cable	2 2.3 1 8
2.2.3.1 9 Observe haul down panel lights cycling	2 2.3.1.9
2.2.3.1 10 Call three green on the haul down panel	2 2.3 1.10
2.2.3.1.11 Acknowledge call of three green	1.1 1.2.5
2.2.3.1.12 Observe deck crew moving out from under helo	2.2.3 1 12
2.2.3.1.13 Receive call of three green	1.1 1.1 5
2.2.3 1.14 Receive acknowledgement of three green call	1 2 1 2.8

	Source Goal
2.2.3.1.15 Flash landing lights	2.2.3.1.15
2.2.3.2 Wait for Hover Tension to be Applied	
2.2.3.2.1 Call LSO to inform three green on the panel	2.2.3.2.1
2.2.3.2.2 Receive acknowledgement from the LSO regarding three green	1.2.1.2.8
2.2.3.3 Maintain Hover	
2.2.3.3.1 Wait for hover tension to be applied	2.1.1.2.1
2.2.3.3.2 Provide conning advisory	2.1.2.4.2
2.2.3.3.3 Receive conning advisory	2.1.3.2.4
2.2.3.4 Centre Helo when Tension Applied	
2.2.3.4.1 Sense centring force from hover tension being applied	2.2.3.4.1
2.2.3.4.2 Centre over trap in high hover	2.2.3.4.2
2.2.3.5 Monitor Hook-up	
2.2.3.5.1 Monitor hook-up sequence	2.2.3.5.1
2.2.5 Land Helo	
2.2.5.1 Fly Helo to Low Hover	
2.2.5.1.1 Transition to low hover	2.1.3.1.1
2.2.5.1.2 Establish low hover	2.1.2.4.2
2.2.5.2 Position Helo and Await the Deck	
2.2.5.2.1 Await the deck	2.1.2.4.3
2.2.5.2.2 Provide fore and aft conning advisory	2.1.2.4.2
2.2.5.2.3 Maintain hover relative to ship	2.1.1.2.1
2.2.5.2.4 Receive conning advisory from NFP	2.1.3.2.4
2.2.5.3 Land Helo	
2.2.5.3.1 Call ready to land	2.1.3.3.1
2.2.5.3.2 Receive conning from LSO	2.1.3.3.2
2.2.5.3.3 Receive executive to land helo	2.1.3.3.3
2.2.5.3.4 Observe trafficators switch to green	1.1.1.3.4
2.2.5.3.5 Land helo	2.1.3.3.5
2.2.5.3.6 Receive call that helo is trapped and to lower tail probe	2.1.3.3.6
2.2.5.3.7 Lower tail probe	2.1.3.3.7
2.2.5.3.8 Receive call from LSO saying tail probe is down	2.1.3.3.8
2.2.5.3.9 Depress ASE switch	2.1.3.3.9
2.2.5.3.10 Observe trafficators are turned off	2.1.3.3.10
2.2.5.3.11 Flash landing lights	2.1.3.3.1
2.2.5.3.12 Observe hand signals from LSO to lower tail probe	2.2.5.3.12
2.2.5.3.13 Observe "thumbs up" signal from LSO indicating tail probe is dow	2.2.5.3.13

	Source Goal
2.3 Night Freedeck Landing	
2.3.1 Prepare to Land Helo	
2.3.1.1 Verify Flight Deck Status	
2.3.1.1.1 Look over ship for safety and readiness	2.1.1.1.1
2.3.1.2 Maintain Hover Relative to Ship	
2.3.1.2.1 Maintain hover relative to ship	2.1.1.2.1
2.3.1.3 Wait for Clearance from LSO	
2.3.1.3.1 Wait for clearance from LSO	
2.3.2 Position Helo for Landing	
2.3.2.1 Receive clearance from LSO	
2.3.2.1.1 Receive Signal Charlie from LSO	2.1.2.1.1
2.3.2.1.2 Observe trafficators switch to green	1.1.1.3.4
2.3.2.1.3 Acknowledge Signal Charlie	1.1.1.2.5
2.3.2.2 Fly Helo Forward Abeam Spot	
2.3.2.2.1 Fly helo forward abeam spot	2.1.2.2.1
2.3.2.3 Lower Landing Gear	
2.3.2.3.1 Lower landing gear	2.1.2.3.1
2.3.2.3.2 Check left hand bug light	2.1.2.3.2
2.3.2.3.3 Confirm left hand bug light is illuminated	2.1.2.3.3
2.3.2.3.4 Check right hand bug light	2.1.2.3.2
2.3.2.3.5 Confirm right hand bug light is illuminated	2.1.2.3.5
2.3.2.3.6 Check panel and gear handle lights to confirm landing gear down	2.1.2.3.6
2.3.2.3.7 Confirm gear down and locked	2.1.2.3.7
2.3.2.3.8 Acknowledge call that landing gear is down and locked	1.1.1.2.5
2.3.2.3.9 Receive confirmation of left hand bug light	2.1.2.3.9
2.3.2.3.10 Receive confirmation of right hand bug light	2.1.2.3.9
2.3.2.3.11 Receive that gear is down and locked	2.1.2.3.11
2.3.2.3.12 Receive acknowledgement that gear is down and locked	1.2.1.2.8
2.3.2.4 Move Helo into High Higher	
2.3.2.4.1 Fly helo into High Hover position	2.1.2.4.1
2.3.2.4.2 Provide fore and aft conning advisory	2.1.2.4.2
2.3.2.4.3 Wait for steady deck	2.1.2.4.3
2.3.2.4.4 Maintain hover relative to ship	2.1.1.2.1
2.3.2.4.5 Observe trafficators switch to amber	1.1.1.3.4
2.3.2.4.6 Guard Throttle	2.1.2.4.6
2.3.2.5 Monitor Position of Helo for Landing	

ANNEX D - INVENTORY OF GOALS

	Source Goal
2.3.2.5.1 Watch position of helo for landing	2.1.2.5.1
2.3.3 Land Helo	
2.3.3.1 Fly Helo to Low Hover	
2.3.3.1.1 Fly helo to Low Hover	2.1.3.1.1
2.3.3.1.2 Provide fore and aft conning advisory	2.1.2.4.2
2.3.3.2 Position Helo and Await the Deck	
2.3.3.2.1 Position helo and awaits the deck	2.1.2.4.3
2.3.3.2.2 Provide fore and aft conning advisory	2.1.2.4.2
2.3.3.2.3 Maintain hover relative to ship	2.1.1.2.1
2.3.3.2.4 Receive conning advisory from NFP	2.1.3.2.4
2.3.3.3 Land Helo	
2.3.3.3.1 Call ready to land	2.1.3.3.1
2.3.3.3.2 Receive conning from LSO	2.1.3.3.2
2.3.3.3.3 Receives executive to land helo	2.1.3.3.3
2.3.3.3.4 Observe trafficators switch to green	1.1.1.3.4
2.3.3.3.5 Land helo	2.1.3.3.5
2.3.3.3.6 Receive call that helo is trapped and to lower tail probe	2.1.3.3.6
2.3.3.3.7 Lower tail probe	2.1.3.3.7
2.3.3.3.8 Receive call from LSO saying tail probe is down	2.1.3.3.8
2.3.3.3.9 Depress ASE switch	2.1.3.3.9
2.3.3.3.10 Observe trafficators are turned off	2.1.3.3.10
2.3.3.3.11 Verify tail probe light	2.1.3.3.7
2.3.3.4 Maintain Position of Helo for Landing	
2.3.3.4.1 Maintain position until landing can be achieved	1.1.1.1.7
3 Takeoff	
3.1 Takeoff	
3.1.1 Prepare to Launch Helo	
3.1.1.1 Conduct Pre-Takeoff Checks	
3.1.1.1.1 Request pre takeoff checklist be completed	1.1.1.1.3
3.1.1.1.2 Receive call to complete pre take off checklist	1.2.1.2.17
3.1.1.1.3 Acknowledge request to conduct pre take off checks	1.1.1.2.5
3.1.1.1.4 Complete pre take off checklist	1.1.1.1.1
3.1.1.1.5 Report pre take off checks are complete	1.1.1.1.2
3.1.1.1.6 Receive that pre take off checks are complete	1.1.1.1.5
3.1.1.1.7 Receives acknowledgement	1.1.1.2.5
3.1.1.2 Complete Panel Checklist	

	Source Goal
3.1.1.2.1 Request panel check list be completed	1.1.1.1.3
3.1.1.2.2 Receive call to conduct panel check list	1.2.1.2.17
3.1.1.2.3 Acknowledge call	1.1.1.2.5
3.1.1.2.4 Receive acknowledgement	1.2.1.2.8
3.1.1.2.5 Check rotor brake	3.1.1.2.5
3.1.1.2.6 Check tail wheel locked	3.1.1.2.6
3.1.1.2.7 Check brakes are set	3.1.1.2.7
3.1.1.2.8 Check pylon is locked	3.1.1.2.8
3.1.1.2.9 Check servos are operating	3.1.1.2.9
3.1.1.2.10 Check engine instruments are correct	3.1.1.2.10
3.1.1.2.11 Check throttles are full	1.1.1.4.9
3.1.1.2.12 Report panel check complete	1.1.1.1.2
3.1.1.2.13 Receive report that panel check is complete	1.1.1.1.5
3.1.1.2.14 Acknowledge report that panel checks are complete	1.1.1.2.5
3.1.1.2.15 Receive acknowledgement	1.2.1.2.8
3.1.1.3 Wait for Clearance from LSO	
3.1.2 Launch Helo	
3.1.2.1 Launch Helo	
3.1.2.1.1 Receive call from LSO to launch	3.1.2.1.1
3.1.2.1.2 Calls to engage ASE	1.1.1.1.3
3.1.2.1.3 Acknowledge ASE request	1.1.1.2.5
3.1.2.1.4 Engage ASE	1.3.1.1.24
3.1.2.1.5 Calls to inform ASE is on	1.1.1.1.2
3.1.2.1.6 Receive call that ASE engaged	1.1.1.1.5
3.1.2.1.7 Receive call from LSO to raise tail probe	3.1.2.1.1
3.1.2.1.8 Raise tail probe	2.1.3.3.7
3.1.2.1.9 Receive call from LSO informing tail probe is up	3.1.2.1.1
3.1.2.1.10 Receives call from LSO to take off	3.1.2.1.1
3.1.2.1.11 Take off	3.1.2.1.11
3.1.2.2 Check Helo & Area	
3.1.2.2.1 Check area around helo	3.1.2.2.1
4 Departure	
4.1 Day Departure	
4.1.1 Move Helo Away from Ship	
4.1.1.1 Fly Helo to Abeam Ship	

ANNEX D - INVENTORY OF GOALS

	Source Goal
4.1.1.1.1 Fly helo abeam ship	4.1.1.1.1
4.1.1.2 Raise Landing Gear	
4.1.1.2.1 Raise landing gear	4.1.1.2.1
4.1.1.2.2 Report gear is up	1.1.1.1.2
4.1.1.2.3 Acknowledges gear up report	1.1.1.2.5
4.1.2 Transition Forward	
4.1.2.1 Transition Forward	
4.1.2.1.1 Fly helicopter forward and up	4.1.2.1.1
4.1.2.1.1 Forward flight achieved	1.1.1.1.7
4.1.2.1.2 Call safe single engine speed	1.1.2.1.2
4.1.3 Post Takeoff Checks & Comms	
4.1.3.1 Post Takeoff Checks	
4.1.3.1.1 Call for post take off and cabin checks	1.1.1.1.3
4.1.3.1.2 Conduct post take off checks	1.1.1.1.1
4.1.3.1.3 Receive call from GIB confirming cabin check complete	1.1.1.1.2
4.1.3.1.4 Receive call to conduct post take off checks	1.2.1.2.17
4.1.3.1.5 Acknowledge call to complete post take off checks	1.1.1.2.5
4.1.3.1.6 Report post take off checks complete	1.1.1.1.2
4.1.3.1.7 Receive call confirming post take off checks complete	1.1.1.1.5
4.1.3.2 Communicate with Ship	
4.1.3.2.1 Monitor comms between TACCO and ship	1.1.1.1.6
4.2 Night Departure	
4.2.1 Move Helo away from Ship	
4.2.1.1 Fly Helo to Abeam & Aft of Ship	
4.2.1.1.1 Fly helo abeam ship	4.1.1.1.1
4.2.1.2 Raise Landing Gear	
4.2.1.2.1 Raise landing gear	4.1.1.2.1
4.2.1.2.2 Report gear is up	1.1.1.1.2
4.2.1.2.3 Acknowledge gear is up	1.1.1.2.5
4.2.2 Transition Forward	
4.2.2.1 Transition Forward	
4.2.2.1.1 Begin altitude over airspeed climb	4.2.2.1.1
4.2.2.1.2 Call instruments and Safe Single Engine Speed	4.2.2.1.2
4.2.2.1.3 Call "Going to instruments"	4.2.2.1.3
4.2.2.1.4 Call to cease reporting	1.1.1.1.3
4.2.2.1.5 Receives cease reporting call	1.2.1.2.17

	Source Goal
4.2.3 Post Takeoff Checks & Comms	
4.2.3.1 Post Takeoff Checks	
4.2.3.1.1 Call for post take off and cabin checks	1.1.1.1.3
4.2.3.1.2 Conduct post take off checks	1.1.1.1.1
4.2.3.1.3 Receive call from GIB confirming cabin check complete	1.1.1.1.2
4.2.3.1.4 Receive call to conduct post take off checks	1.2.1.2.17
4.2.3.1.5 Acknowledge call to complete post take off checks	1.1.1.2.5
4.2.3.1.6 Report post take off checks complete	1.1.1.1.2
4.2.3.1.7 Receive call confirming post take off checks complete	1.1.1.1.5
4.2.3.2 Communicate with Ship	
4.2.3.2.1 Monitor comms between TACCO and ship	1.1.1.1.6
5 Maintain Safety of Aircraft	

ANNEX E

DETAILED GOAL ANALYSIS

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 1 Complete pre landing checklist

Description: On order of Pilot, NFP uses checklist to confirm the status of each item and prepare appropriately for landing conditions All crew, passengers and loose items or material is to be secured by GIB (Guy in Back)

Completion Time: (seconds) 60

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition 0 None
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of checklist status
2
3

Input Interface(s)

1 Paper checklist
2
3
4
5

VACP Ratings

Vision: 2
Audition: 0
Cogntive: 5
Psychomotor: 3

Goal Criticality

Safety: 6 **Mission:** 5 **Efficiency:** 1 **Reliability:** 7 **Cost:** 4 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 1 Complete pre landing checklist

Description: On order of Pilot, NFP uses checklist to confirm the status of each item and prepare appropriately for landing conditions All crew, passengers and loose items or material is to be secured by GIB (Guy in Back)

Knowledge Requirements

Declarative

1 Checklist procedures
2 Aircraft and systems operations and procedures
3
4
5

Situational

1 Understanding which systems are in use their state
2
3
4
5

Initiating Conditions

1 Decision to return to ship for recovery
2 Order of pilot
3
4
5

Initiating Actions

1 Pick-up checklist
2
3
4
5

Ending Conditions

1 Checklist completed successfully
2
3
4
5

Ending Actions

1 Return check-list to storage
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Checklist	Read/scan checklist
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 2 Report that pre landing checks are complete

Description: NFP tells Pilot over intercom that checks or other requested actions are complete when they are completed. This also applies to any checks such as cabin check that may be conducted by guy in back

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 0
Psychomotor: 2

Influenced External Variables

1 Pre-landing checklist complete message status Global
2
3

Influenced Internal Variables

1 Perception of message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 2 **Mission:** 1 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 2

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 2

Criticality Rationale:

This task has slight potential to adversely affect Safety if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1.1.1.1.2 Report that pre landing checks are complete

Description: NFP tells Pilot over intercom that checks or other requested actions are complete when they are completed. This also applies to any checks such as cabin check that may be conducted by guy in back.

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Understanding that checklist is complete and
2 accurate
3
4
5

Initiating Conditions

1 Checks are complete
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot is informed that checks are complete
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

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ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 1 Receives numbers for recovery from TACCO

Description: Tacco informs pilot of numbers as passed from SAC The numbers are ships flying course (heading and speed), true wind (direction from and speed), relative wind (direction and speed), and altimeter setting

Completion Time: (seconds) 10

Feedback to Higher Level Goal: F

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of numbers for recovery
2
3

Input Interface(s)

1 Radio(s)
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 7
Psychomotor: 0

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal. 1 1 1 2 1 Receives numbers for recovery from TACCO

Description: Tacco informs pilot of numbers as passed from SAC The numbers are ships flying course (heading and speed), true wind (direction from and speed), relative wind (direction and speed), and altimeter setting

Knowledge Requirements

Declarative

1 SHOPS and helicopter operating parameters
2
3
4
5

Situational

1 Understanding how to apply the numbers given
2 and how they apply to the specific situation
3
4
5

Initiating Conditions

1 Helo inbound for recovery
2 Ship has calculated numbers
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Numbers are successfully passed to helo
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 4 Receives clearance to close ship from TACCO

Description: Tacco communicates over radios to SAC and receives clearance to close the ship Rest of crew monitors radios and confirms clearance is acceptable

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 *Memorization*

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of clearance status
2
3

Input Interface(s)

1 Radio(s)
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 2
Psychomotor: 0

Goal Criticality

Safety: 2 **Mission:** 5 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal. 1 1 1 2 4 Receives clearance to close ship from TACCO

Description: *Tacco communicates over radios to SAC and receives clearance to close the ship Rest of crew monitors radios and confirms clearance is acceptable*

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Radhaz Safe
2 Helo inbound for landing
3
4
5

Initiating Actions

1 Monitor radio(s)
2
3
4
5

Ending Conditions

1 Clearance passed successfully
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 6 Receive control of radios for landing from TACCO
Description: SAC tells helo to call Paddles for control Tacco passes control of radios to Pilot

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of radio control
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2 ICS
3
4
5

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 6 Receive control of radios for landing from TACCO

Description: SAC tells helo to call Paddles for control Tacco passes control of radios to Pilot

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 SAC passed control of helo to LSO
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Pilot takes control of radios
2
3
4
5

Ending Actions

1 Take control of radios
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 7 Take control of radios
Description: Pilot receives acknowledgement from Tacco over the intercom that he has control of the radios

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 1 Automatised
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of acknowledgement status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 2

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 2

Criticality Rationale:

This task has slight potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 7 Take control of radios

Description. Pilot receives acknowledgement from Tacco over the intercom that he has control of the radios

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Pilot has acknowledged TACCO
2
3
4
5

Initiating Actions

1 Monitor ICS
2
3
4
5

Ending Conditions

1 TACCO has acknowledged pilot
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 7 Take control of radios
Description: Pilot acknowledges to Tacco control of radios

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 1 Automatised
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Control of radios Global
2
3

Influenced Internal Variables

1 Perception of radio control
2 Perception of message status
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 7 Take control of radios

Description: Pilot acknowledges to Tacco control of radios

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 TACCO passes control of radios
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot has acknowledged TACCO
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 8 Receive acknowledgement from TACCO
Description:

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of acknowledgement
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 2 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 8 Receive acknowledgement from TACCO

Description:

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 FP has reported that he has taken control of the radios
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 FP has been acknowledged
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 11 Call Paddles for control
Description: After acknowledging SAC that control has been passed to LSO, calls LSO for control

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 0 None
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Status of message to Paddles Global
2
3

Influenced Internal Variables

1 Perception of message status
2
3

Output Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Input Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Goal Criticality

Safety: 3 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 11 Call Paddles for control

Description: After acknowledging SAC that control has been passed to LSO, calls LSO for control

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 SAC tells helo to call paddles for control
2
3
4
5

Initiating Actions

1 Actuate radio switch
2
3
4
5

Ending Conditions

1 Paddles called for control
2
3
4
5

Ending Actions

1 Release radio switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Radio switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 3 Plan Approach

Source Goal: 1 1 1 3 1 Decide on approach plan

Description: Pilot considers the numbers given to decide on how approach should be flown to ship Generally, helo will approach the ship from astern if it is into wind to come into a hover on the port or starboard side as appropriate

Completion Time: (seconds) 10

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Contents of approach plan
2 Status of approach plan
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Long term memory (SOPs, aircraft characteristi
2 Short term memory (numbers for recover)
3 External scene
4
5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 3 1 Decide on approach plan

Description: Pilot considers the numbers given to decide on how approach should be flown to ship Generally, helo will approach the ship from astern if it is into wind to come into a hover on the port or starboard side as appropriate

Knowledge Requirements

Declarative

1 SHOPS
2 Wind numbers
3
4
5

Situational

1 Effect of winds on helicopter for recovery
2
3
4
5

Initiating Conditions

1 Numbers must have been received and found acceptable
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Plan decided upon
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 3 Plan Approach

Source Goal: 1 1 1 3 2 Brief crew on approach plan
Description: Pilot will brief crew on how the approach will be flown as required

Completion Time: (seconds) 15
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1	Status of approach briefing	Global
2	Crew's understanding of approach plan	Global
3		

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of approach briefing status
2
3

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 6
Psychomotor: 2

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 3 2 Brief crew on approach plan

Description: Pilot will brief crew on how the approach will be flown as required

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Approach plan has been decided upon
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Plan briefed to crew
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 3 Accept numbers for recovery
Description: If numbers are correct pilot informs Tacco who will acknowledge them to the SAC

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Status of message accepting numbers Global
2
3

Influenced Internal Variables

1 Perception of message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 1 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 2

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 2

Criticality Rationale:

This task has slight potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 3 Accept numbers for recovery

Description: If numbers are correct pilot informs Tacco who will acknowledge them to the SAC

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Understanding of the significance of numbers
2 passed with regards to current situation and
3 operating parameters of the helo
4
5

Initiating Conditions

1 Numbers must have been assessed for suitability
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Tacco is informed
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 2 Assess numbers as passed by SAC via TACCO
Description: Pilot and crew discuss numbers as required to assess whether they make sense and if they are within limits

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of suitability of numbers for recover
2
3

Input Interface(s)

1 Short term memory
2
3
4
5

VACP Ratings

Vision: 0
Audition: 0
Cognitive: 7
Psychomotor: 0

Goal Criticality

Safety: 7 **Mission:** 4 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 2 Assess numbers as passed by SAC via TACCO

Description: Pilot and crew discuss numbers as required to assess whether they make sense and if they are within limits

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Understanding of the significance of numbers
2 passed with regards to current situation and
3 operating parameters of the helo
4
5

Initiating Conditions

1 Numbers must be received from ship
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Numbers have been assessed as either suitable or not
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 5 Acknowledge TACCO's clearance to close ship
Description: Pilot acknowledges Tacco that the helo has clearance to close the ship

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of clearance acknowledgement Global
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of clearance acknowledgement statu
2
3

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 2 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 5 Acknowledge TACCO's clearance to close ship

Description: Pilot acknowledges Tacco that the helo has clearance to close the ship

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3 Radhaz procedures
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Clearance passed to close ship
2
3
4
5

Initiating Actions

1 Actuate radio switch
2
3
4
5

Ending Conditions

1 Acknowledgement passed
2
3
4
5

Ending Actions

1 Release radio switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 12 Receive clearance from Paddles to delta hover astern
Description: Pilot receives clearance from LSO to Delta Hover Astern

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of clearance status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 12 Receive clearance from Paddles to delta hover astern

Description: Pilot receives clearance from LSO to Delta Hover Astern

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Ship within 90 degrees of flying course during the day
2 Helo inbound for landing
3
4
5

Initiating Actions

1 Monitor radio(s)
2
3
4
5

Ending Conditions

1 Clearance passed to helo successfully
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 3 Plan Approach

Source Goal: 1 1 1 3 3 Sight ship

Description: Whichever crew member sights the ship first will inform the others Pilot will generally fly visually to ship at this point

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1. Perception of ship location
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 9 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 3 3 Sight ship

Description: Whichever crew member sights the ship first will inform the others Pilot will generally fly visually to ship at this point

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Ship	Sight ship out window
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 3 Plan Approach

Source Goal: 1 1 1 3 4 Observe trafficators are amber
Description: Pilot will visually observe trafficators Trafficators should switch to amber

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 0 None
Kinesthetic: 0 None

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of trafficator status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 3 4 Observe trafficators are amber

Description: Pilot will visually observe trafficators Trafficators should switch to amber

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding significance of trafficator lights
2
3
4
5

Initiating Conditions

1 Trafficators are illuminated or change colour
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Pilot has observed trafficators
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	**Target**	**Action**
1	Eyes	Trafficators	Sight trafficators lights change to amber
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 2 Fly Approach
Third Level: 1 1 2 1 Fly Approach

Source Goal: 1 1 2 1 1 Commence descent and deceleration

Description: As the helo comes to an appropriate distance from the ship, which depends on the conditions of the day, the pilot will lower the collective and pull back on the cyclic to begin a deceleration and descent

Completion Time: (seconds) 30

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 8 **Mission:** 9 **Efficiency:** 6 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 2 1 1 Commence descent and deceleration

Description: As the helo comes to an appropriate distance from the ship, which depends on the conditions of the day, the pilot will lower the collective and pull back on the cyclic to begin a deceleration and descent

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1 Position of helo in relation to ship
2
3
4
5

Initiating Conditions

1 Helo in position relative to ship to commence decent and decele
2
3
4
5

Initiating Actions

1 Apply control inputs
2
3
4
5

Ending Conditions

1 Helo in Delta Hover Astern or in position to land
2
3
4
5

Ending Actions

1 Stop applying control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Lower collective to initiate descent
2	Right Hand	Cyclic	Pull cyclic back to slow the helo and raise the nose
3	Both Feet	Tail Rotor Pedals	Use pedals to maintain heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 2 Fly Approach
Third Level: 1 1 2 1 Fly Approach

Source Goal: 1 1 2 1 2 Call safe single engine speed
Description: When the aircraft passes through the Safe Single Engine Speed as calculated in the pre-landing checklist, the NFP will inform the Pilot verbally

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Safe engine speed message status Global
2
3

Influenced Internal Variables

1 Perception of message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 2 1 2 Call safe single engine speed

Description: When the aircraft passes through the Safe Single Engine Speed as calculated in the pre-landing checklist, the NFP will inform the Pilot verbally

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Helo operating parameters
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo has reached Safe Single Engine Speed
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot has been informed that Safe Single Engine Speed has b
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Index Finger	Intercom switch on side console	Pinch grip to actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 2 Position helo at FAF

Description: Flying Pilot will fly helo to Final Approach fix in anticipation of flying a pilot monitored night approach

Completion Time: (seconds) 1000

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5 Flight instruments

VACP Ratings

Vision: 6
Audition: 0
Cognitive: 7
Psychomotor: 5

Goal Criticality

Safety: 5 **Mission:** 7 **Efficiency:** 5 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 2 Position helo at FAF

Description: Flying Pilot will fly helo to Final Approach fix in anticipation of flying a pilot monitored night approach

Knowledge Requirements

Declarative

1 FLOPs
2 SHOPs
3 Night Procedures
4 Helicopter operating procedures
5

Situational

1 Ships position
2 Ships readiness to recover the helo
3
4
5

Initiating Conditions

1 Helo has received permission to close ship
2
3
4
5

Initiating Actions

1 Apply control inputs
2
3
4
5

Ending Conditions

1 Helo is positioned at Final Approach Fix
2
3
4
5

Ending Actions

1 Stop applying control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 3 Observe two mile lighting on ship

Description: Pilot will visually observe ship to see two mile lighting. This lighting is set so as to aid the pilot on approach by providing additional references to position helo relative to ship

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of flight deck lighting
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 0 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 2

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 2

Criticality Rationale:

This task has slight potential to adversely affect Mission Effectiveness/Completion if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 3 Observe two mile lighting on ship

Description: Pilot will visually observe ship to see two mile lighting. This lighting is set so as to aid the pilot on approach by providing additional references to position helo relative to ship

---

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding significance of ships lights
2
3
4
5

Initiating Conditions

1 Helo will be inbound toward ship
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Ship	View lights change on ship
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 5 Fly Pilot Monitored Approach

Description: Pilot will revert to instrument flying while NFP will observe the ship and approach visually As the pilot flies the approach, the NFP will provide conning instructions to the Pilot

Completion Time: (seconds) 60

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 5 Verbal decoding, speech recognition
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 3
Audition: 4
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3 Perception of desired aircraft position

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 ICS
5

Goal Criticality

Safety: 7 **Mission:** 5 **Efficiency:** 6 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal. 1 2 2 1 5 Fly Pilot Monitored Approach

Description: Pilot will revert to instrument flying while NFP will observe the ship and approach visually As the pilot flies the approach, the NFP will provide conning instructions to the Pilot

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Helicopter operating procedures
3 Instrument flying procedures
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Approach has been planned and briefed
2 Helo cleared to close ship for an approach
3
4
5

Initiating Actions

1 Apply control inputs
2 Scan flight instruments
3
4
5

Ending Conditions

1 Approach is complete
2
3
4
5

Ending Actions

1 Stop applying control inputs
2 Stop scanning instruments
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Raise and lower the collective to fly the approach
2	Right Hand	Cyclic	Manipulate cyclic to fly approach
3	Both Feet	Tail Rotor Pedals	Use foot pedals to control heading to affect approach
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 6 Monitor Pilot Monitored Approach

Description: Pilot will revert to instrument flying while NFP will observe the ship and approach visually As the pilot flies the approach, the NFP will provide conning instructions to the Pilot The NFP will also cross check to the instruments to ensure the safety of flight

Completion Time: (seconds) 60

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 3 Spatial decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 3
Audition: 4
Cognitive: 7
Psychomotor: 2

Influenced External Variables

1 Status of conning instructions Global
2
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of desired aircraft position
3 Perception of status of conning instruction mes

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3 External scene
4 Flight instruments
5

Goal Criticality

Safety: 6 **Mission:** 4 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 6 Monitor Pilot Monitored Approach

Description: Pilot will revert to instrument flying while NFP will observe the ship and approach visually As the pilot flies the approach, the NFP will provide conning instructions to the Pilot The NFP will also cross check to the instruments to ensure the safety of flight

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Helicopter operating procedures
3 Instrument flying procedures
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot monitored approach has been commenced
2
3
4
5

Initiating Actions

1 Scan external scene
2
3
4
5

Ending Conditions

1 Approach is complete
2
3
4
5

Ending Actions

1 Stop scanning external scene
2 Stop cross-checking flight instruments
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1.2 2 1.7 Call for one mile lighting

Description: When approximately one mile from the ship the pilot will either ask the NFP to switch the lights or the NFP will do this automatically

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Status of lighting request Global
2
3

Influenced Internal Variables

1 Perception of lighting request status
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 7 Call for one mile lighting

Description: When approximately one mile from the ship the pilot will either ask the NFP to switch the lights or the NFP will do this automatically

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Position of helo in relation to ship
2
3
4
5

Initiating Conditions

1 Helo approximately one mile from ship
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Call has been made to switch to one mile lighting
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 9 Switch lights to one mile lighting

Description: NFP will switch lights Switching to one mile lighting includes switching Anti-collision lights off, Navigation lights off, and Probe Illum lights on This is the signal to the LSO to switch to One Mile lighting on the flight deck NFP is in right seat at this point

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of aircraft lighting Global
2 Position of panel switches Global
3

Output Interface(s)

1 Overhead panel switches
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of aircraft lighting
2 Perception of position of overhead panel switc
3

Input Interface(s)

1 Overhead panel switches
2
3
4
5

VACP Ratings

Vision: 5
Audition: 0
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 9 Switch lights to one mile lighting

Description: NFP will switch lights Switching to one mile lighting includes switching Anti-collision lights off, Navigation lights off, and Probe Illum lights on This is the signal to the LSO to switch to One Mile lighting on the flight deck. NFP is in right seat at this point

---

Knowledge Requirements

Declarative

1 Helo lighting system
2 SHOPs
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot has called for one mile lighting
2
3
4
5

Initiating Actions

1 Switch anti-collision lights off
2
3
4
5

Ending Conditions

1 One mile lighting switches are made
2
3
4
5

Ending Actions

1 Switch Probe Illum lights on
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Overhead panel switches	Select appropriate switches from overhead panel to turn on and off appropriate
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 10 Observe change in flight deck lighting to one mile lighting

Description: NFP will observe flight deck lighting change The Dustpan lights, Hangar face, Hangar top, CIWS lighting and Horizon bars will illuminate The Strobe and centre line lights will extinguish This lighting is set to provide the maximum visual reference for the pilot on landing

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of flight deck lighting
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 2

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 2

Criticality Rationale:

This task has slight potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 10 Observe change in flight deck lighting to one mile lighting

Description: NFP will observe flight deck lighting change The Dustpan lights, Hangar face, Hangar top, CIWS lighting and Horizon bars will illuminate The Strobe and centre line lights will extinguish This lighting is set to provide the maximum visual reference for the pilot on landing

---

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding significance of ships lights
2
3
4
5

Initiating Conditions

1
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Ship	Observe light changes
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 1 Pass controls to NFP

Description: Pilot tells the NFP over the intercom "You have control" When the NFP responds in the affirmative and takes control, the Pilot will release the controls

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Control of aircraft Global
2
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 5 Verbal decoding, speech recognition
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft control
2
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

VACP Ratings

Vision: 1
Audition: 4
Cognitive: 2
Psychomotor: 5

Goal Criticality

Safety: 8 **Mission:** 3 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1.2.2.1.1 Pass controls to NFP

Description: Pilot tells the NFP over the intercom "You have control". When the NFP responds in the affirmative and takes control, the Pilot will release the controls.

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Helo operating procedures
3
4
5

Situational

1 Knowing that other pilot is prepared and ready
2 to assume control of helo
3
4
5

Initiating Conditions

1 NFP ready to assume controls
2 Pilot calls "You have control"
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 NFP takes control of helo
2 NFP calls "I have control"
3
4
5

Ending Actions

1 Release ICS switch
2 Release flight controls
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Release grip
2	Right Hand	Cyclic	Release grip
3	Both Feet	Tail Rotor Pedals	Release grip
4	Right Index Finger	Intercom switch on cyclic	Actuate and hold

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 12 Establish hover in delta hover astern position

Description: As the helo approaches the ship, the pilot will continue to descend and decelerate until he comes into position just aft and to the side of the ship on its quarter Which side of the ship depends on the relative wind If it is a red wind the pilot will fly to the port side of the ship Starboard otherwise As the helo nears the ship, the NFP will continue conning and cross checking instruments At this point the NFP may take control of the aircraft

Completion Time: (seconds) 20
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Influenced External Variables

1 Position of helicopter Global
2 Position of flight controls Global
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 5

Goal Criticality

Safety: 9 **Mission:** 5 **Efficiency:** 9 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 1 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Efficiency if improperly performed The demands of this task approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal. 1 2 2 1 12 Establish hover in delta hover astern position

Description: As the helo approaches the ship, the pilot will continue to descend and decelerate until he comes into position just aft and to the side of the ship on its quarter Which side of the ship depends on the relative wind If it is a red wind the pilot will fly to the port side of the ship Starboard otherwise As the helo nears the ship, the NFP will continue conning and cross checking instruments At this point the NFP may take control of the aircraft

Knowledge Requirements

Declarative

1 Understanding significance of ships lights
2 SHOPs
3
4
5

Situational

1 Understanding of recovery process
2
3
4
5

Initiating Conditions

1 Approach has been conducted
2
3
4
5

Initiating Actions

1 Apply control inputs
2
3
4
5

Ending Conditions

1 Helo established in Delta Hover Astern and position is being
2
3
4
5

Ending Actions

1 Stop applying control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Cyclic	Pull cyclic back to flare and then centre to maintain hover
2	Left Hand	Collective	Lower collective while decelerating, then raise to maintain hover
3	Both Feet	Tail Rotor Pedals	Use pedals to prevent yaw and maintain heading
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 13 Take control of helo from FP

Completion Time: (seconds) 10

Description: As the helo nears the ship, the NFP will continue conning and cross checking instruments When the NFP feels his references are good enough he will take control of the helo First he will say "I'm coming on the controls lightly" and place his hands and feet on the controls This is done to accustom the NFP to the control feeling and how the helo is flying prior to assuming full control When fully comfortable he will say "I have control" and take control of helo

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 5 Verbal decoding, speech recognition
Memory: 0 None
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 3
Audition: 4
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1 Control of aircraft Global
2
3

Influenced Internal Variables

1 Perception of aircraft control
2
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 ICS
2 Cyclic
3 Collective
4 Tail rotor pedals
5 ICS switch

Goal Criticality

Safety: 8 **Mission:** 5 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 13 Take control of helo from FP

Description: As the helo nears the ship, the NFP will continue conning and cross checking instruments When the NFP feels his references are good enough he will take control of the helo First he will say "I'm coming on the controls lightly" and place his hands and feet on the controls This is done to accustom the NFP to the control feeling and how the helo is flying prior to assuming full control When fully comfortable he will say "I have control" and take control of helo

---

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Knowledge of aircraft situation
2 Being prepared to assume control
3
4
5

Initiating Conditions

1 NFP ready to assume control
2 NFP calls "I have control"
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot calls "You have control"
2
3
4
5

Ending Actions

1 Take controls
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Take hold lightly
2	Right Hand	Cyclic	Take hold lightly
3	Both Feet	Tail Rotor Pedals	Place feet lightly
4	Right Index Finger	Intercom switch on cyclic	Actuate and hold

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 15 Watch flight instruments

Description: The now NFP will continue to monitor the instruments calling altitude and airspeed to ensure safety of flight Attention is particularly paid to the radar altimeter and airspeed indicator

Completion Time: (seconds) 20

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 3
Audition: 2
Cogntive: 7
Psychomotor: 2

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of flight instrument readouts
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Flight instruments
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 15 Watch flight instruments

Description: The non NFP will continue to monitor the instruments calling altitude and airspeed to ensure safety of flight Attention is particularly paid to the radar altimeter and airspeed indicator

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Helicopter systems
3
4
5

Situational

1 Understanding aircraft instruments and their
2 significance to the relevant situation
3
4
5

Initiating Conditions

1 Pilot monitored approach has been initiated
2
3
4
5

Initiating Actions

1 Scan instruments
2
3
4
5

Ending Conditions

1 Approach is complete
2
3
4
5

Ending Actions

1 Stop scanning instruments
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Flight Instruments	Observe appropriate flight instruments in a scan
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 16 Call "Cease reporting"
Description: When the flying pilot becomes completely comfortable and aware of the references to the ship he will say to the NFP to "Cease reporting"

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of cease reporting message Global
2
3

Influenced Internal Variables

1 Perception of cease reporting message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 5
Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 16 Call "Cease reporting"

Description: When the flying pilot becomes completely comfortable and aware of the references to the ship he will say to the NFP to "Cease reporting

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2
3
4
5

Situational

1 Understanding that the helo is in a position that
2 is considered safe so that NFP can cease reporting
3
4
5

Initiating Conditions

1 Helo is in a safe position so that pilot does not require further re
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 NFP ceases reporting
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 1 Prepare to Land Helo
Third Level: 2 1 1 1 Verify Flight Deck Status

Source Goal: 2 1 1 1 1 Look over ship for safety and readiness

Description: Pilot and NFP will visually look over the ship and surrounding area to ensure it is ready for recovery and for safety consideration such as FOD Areas to be observed include the quarterdeck, flightdeck, hanger face, hanger top, and any other conveniently visible areas Ensure flight deck nets are down and secure Check position of trap For hauldown landings, see that the cable is coiled appropriately beside trap At night, check that all lights are illuminated as appropriate and that they are at a comfortable brightness

Completion Time: (seconds) 10

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of ship readiness
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 0 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 1 1 1 Look over ship for safety and readiness

Description: Pilot and NFP will visually look over the ship and surrounding area to ensure it is ready for recovery and for safety consideration such as FOD Areas to be observed include the quarterdeck, flightdeck, hanger face, hanger top, and any other conveniently visible areas Ensure flight deck nets are down and secure Check position of trap For hauldown landings, see that the cable is coiled appropriately beside trap At night, check that all lights are illuminated as appropriate and that they are at a comfortable brightness

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding safety considerations for
2 conducting recovery
3
4
5

Initiating Conditions

1 Helo in position for pilot to be able to observe ship
2
3
4
5

Initiating Actions

1 Scan ship and external scene
2
3
4
5

Ending Conditions

1 Pilot is satisfied of safety situation on ship
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 1 Prepare to Land Helo
Third Level: 2 1 1 2 Maintain Hover Relative to Ship

Source Goal: 2 1 1 2 1 Maintain hover relative to ship

Description: Pilot will maintain hover relative to ship's motion to maintain position This includes if the ship is turning The helo should not be cleared to Delta Hover Astern position unless the ship is within 90 degrees of the flying course during the day and not until it is on the flying course at night Hover while over the ship is the same but there are less hover references and the tendency is to follow the ships motion The pilot must strive to observe the horizon to the greatest extent possible to avoid following the ships motion At night there are fewer references which makes hovering more challenging The horizon bars replace the horizon at night

Completion Time: (seconds) 1000

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1 Position of helicopter Global
2 Position of flight controls Global
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 7 **Mission:** 8 **Efficiency:** 5 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 9

Limits: 1 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion, Cost if improperly performed The demands of this task approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 1 2 1 Maintain hover relative to ship

Description: Pilot will maintain hover relative to ship's motion to maintain position This includes if the ship is turning The helo should not be cleared to Delta Hover Astern position unless the ship is within 90 degrees of the flying course during the day and not until it is on the flying course at night Hover while over the ship is the same but there are less hover references and the tendency is to follow the ships motion The pilot must strive to observe the horizon to the greatest extent possible to avoid following the ships motion At night there are fewer references which makes hovering more challenging The horizon bars replace the horizon at night

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo in a hover relative to ship
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo moves to land or depart after being given a clearance
2
3
4
5

Ending Actions

1 Stop applying control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Manipulate collective to maintain appropriate altitude
2	Right Hand	Cyclic	Manipulate cyclic to maintain position relative to ship
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain appropriate heading
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 1 Receive clearance from LSO

Source Goal: 2 1 2 1 1 Receive Signal Charlie from LSO
Description: LSO calls helo over radio with Signal Charlie Freedeck or Signal Charlie Hauldown Pilot receives call

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Status of clearance to land
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 6 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 1 1 Receive Signal Charlie from LSO

Description: LSO calls helo over radio with Signal Charlie Freedeck or Signal Charlie Hauldown Pilot receives call

---

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Ship ready for recovery
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Clearance passed to helo
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 1 Receive clearance from LSO

Source Goal: 2 1 2 1 2 Observe trafficators switch to green
Description: Pilot visually sights trafficators switch to green

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice:	0	None
Pyschomotor:	0	None
Memory:	1	Memorization

Input/Sensation

Vision:	1 2	Spatial encoding, visual pattern recognition
Audition:	0	None
Memory:	2 4	Verbal decoding
Kinesthetic:	0	None

VACP Ratings

Vision:	1
Audition:	0
Cogntive:	2
Psychomotor:	0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of trafficator status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Trafficators
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 2

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 2

Criticality Rationale:

This task has slight potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 1 2 Observe trafficators switch to green

Description. Pilot visually sights trafficators switch to green

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding significance of ships lights
2
3
4
5

Initiating Conditions

1
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Trafficator lights	Observe lights changing to green
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 2 Fly Helo Forward Abeam Spot

Source Goal: 2 1 2 2 1 Fly forward abeam spot

Description: On receiving and acknowledging clearance, Pilot flies helicopter forward to a position lining up with the bum lines on the flight deck and at the High Hover Altitude

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Influenced External Variables

1 Position of helicopter Global
2 Position of flight controls Global
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 5

Goal Criticality

Safety: 7 **Mission:** 8 **Efficiency:** 6 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 2 1 Fly forward abeam spot

Description: On receiving and acknowledging clearance, Pilot flies helicopter forward to a position lining up with the bum lines on the flight deck and at the High Hover Altitude

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Signal Charlie must have been given
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo in hover abeam landing spot
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Raise and lower collective to maintain altitude during transition
2	Right Hand	Cyclic	Move cyclic to the right and then centre to commence sideward motion Then,
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain heading and prevent unwanted yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 1 Lower landing gear
Description: As pilot reaches position abeam the ship and is preparing to manoeuvre right, the NFP lowers the landing gear handle

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 1 Memorization

Influenced External Variables

1	Position of landing gear	Global
2	Position of landing gear handle	Global
3		

Output Interface(s)

1 Landing gear handle
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 2 Passive (pre attentive) monitoring of auditory signals
Memory: 2 3 Spatial decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of landing gear position
2 Perception of landing gear handle position
3

Input Interface(s)

1 Landing gear handle
2
3
4
5

VACP Ratings

Vision: 1
Audition: 0
Cognitive: 2
Psychomotor: 4

Goal Criticality

Safety: 9 **Mission:** 9 **Efficiency:** 3 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 1 Lower landing gear

Description: As pilot reaches position abeam the ship and is preparing to manoeuvre right, the NFP lowers the landing gear handle

Knowledge Requirements

Declarative

1 SHOPs
2 Helicopter operating procedures
3 Landing gear system
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo abeam landing spot and could be beginning to move to th
2
3
4
5

Initiating Actions

1 Reach to landing gear handle
2
3
4
5

Ending Conditions

1 Landing gear handle lowered
2
3
4
5

Ending Actions

1 Release landing gear handle
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Landing Gear Handle	Reach over and down to lower landing gear handle
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 2 Check left hand bug light
Description: NFP checks in rear view mirror to see if bug light is illuminated indicating gear is down and locked

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice:	0	None
Pyschomotor:	1 1	Automatised, highly learned
Memory:	1	Memorization

Input/Sensation

Vision:	1 2	Spatial encoding, visual pattern recognition
Audition:	2	Passive (pre-attentive) monitoring of auditory signals
Memory:	2 4	Verbal decoding
Kinesthetic:	0	None

VACP Ratings

Vision:	1
Audition:	0
Cognitive:	2
Psychomotor:	0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of bug light status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Rear view mirror
2 Landing gear bug light
3
4
5

Goal Criticality

Safety: 3 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 2 Check left hand bug light

Description: NFP checks in rear view mirror to see if bug light is illuminated indicating gear is down and locked

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2 Landing gear system
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Landing gear handle has been lowered
2
3
4
5

Initiating Actions

1 Look in rear-view mirror
2
3
4
5

Ending Conditions

1 Bug light has been checked
2
3
4
5

Ending Actions

1 Stop looking in rear-view mirror
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Bug lights in rear view mirror	Use mirror to view bug light on landing gear
2	Left Hand	Rear view mirror	Position rear view mirror if unable to view bug light This assumes NFP is in le
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 3 Confirm left hand bug light is illuminated
Description: When NFP sights bug light illuminated he will inform Pilot

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of message re landing gear bug light Global
2
3

Output Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of landing gear bug light message st
2
3

Input Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Goal Criticality

Safety: 2 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal. 2 1 2 3 3 Confirm left hand bug light is illuminated

Description: When NFP sights bug light illuminated he will inform Pilot

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Landing gear system
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Bug light has been checked
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot has been informed that bug light has been checked
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Intercom switch on panel	Actuate and hold using pinch grip
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 5 Confirm right hand bug light is illuminated
Description: When Pilot sees light is illuminated he will inform the NFP

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of message re landing gear bug light   Global
2
3

Output Interface(s)

1 ICS switch on cyclic
2 ICS
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of message re gear bug light status
2
3

Input Interface(s)

1 ICS switch on cyclic
2 ICS
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 2 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 5 Confirm right hand bug light is illuminated

Description: When Pilot sees light is illuminated he will inform the NFP

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Landing gear system
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Bug light has been confirmed illuminated
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 NFP has been informed
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Intercom switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 6 Check panel and gear handle lights to confirm landing gear down

Completion Time: (seconds) 2

Description: After checking bug lights, NFP will check instrument panel indicators looking for two landing gear indicators He will also check the landing gear handle to confirm the lights are extinguished on it

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic:

VACP Ratings

Vision: 4
Audition: 0
Cognitive: 7
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of landing gear status/position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Instrument panel
2 Landing gear handle
3
4
5

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 6 Check panel and gear handle lights to confirm landing gear down

Description: After checking bug lights, NFP will check instrument panel indicators looking for two landing gear indicators He will also check the landing gear handle to confirm the lights are extinguished on it

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2 Landing gear system
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Landing gear handle has been lowered
2
3
4
5

Initiating Actions

1 Scan panel
2
3
4
5

Ending Conditions

1 Panel indicators and landing gear handle lights checked for p
2
3
4
5

Ending Actions

1 Stop scanning panel
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 7 Call gear down and locked
Description: NFP will verbally confirm to pilot that landing gear is down and locked

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of landing gear down message Global
2
3

Output Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of status of landing gear down mess
2
3

Input Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Goal Criticality

Safety: 3 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 7 Call gear down and locked

Description: NFP will verbally confirm to pilot that landing gear is down and locked

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Landing gear system
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 All indications confirm landing gear down and locked
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Pilot has been informed
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Intercom switch on panel	Actuate and hold using a pinch grip
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 4 Move Helo into High Hover

Source Goal: 2 1 2 4 1 Fly helo into High Hover position

Description: Pilot manoeuvres helo into High Hover position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally, the pilot puts the appropriate line on the hangar face between his legs The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines At night the position is the same but the pilot will use the horizon bars for reference

Completion Time: (seconds) 10

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 5 Verbal decoding, speech recognition
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of position of flight controls
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 8 **Mission:** 8 **Efficiency:** 7 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 4 1 Fly helo into High Hover position

Description: Pilot manoeuvres helo into High Hover position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally, the pilot puts the appropriate line on the hangar face between his legs The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines At night the position is the same but the pilot will use the horizon bars for reference

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2 SHOPs
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Signal Charlie has been given
2 Landing gear is down and locked
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo is in High Hover position
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Raise and lower collective while flying helo to position so as to maintain correc
2	Right Hand	Cyclic	Move stick right then centre to initiate motion right Then, move stick to the lef
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain correct heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 4 Move Helo into High Hover

Source Goal: 2 1 2 4 2 Provide fore and aft conning advisory

Description: NFP will provide a verbal conning advisory for the Pilot This will predominantly be in the fore and aft direction but can be in any axis as appropriate

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of conning advisory message Global
2
3

Output Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of conning advisory message status
2
3

Input Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 7 **Mission:** 5 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 4 2 Provide fore and aft conning advisory

Description: NFP will provide a verbal conning advisory for the Pilot. This will predominantly be in the fore and aft direction but can be in any axis as appropriate

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 SHOPs
3
4
5

Situational

1 Helos motion relative to ship
2
3
4
5

Initiating Conditions

1 Helo is in High Hover position
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Helo moves to Low Hover
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Index Finger	Intercom switch on left panel	Actuate and hold using pinch grip
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 4 Move Helo into High Hover

Source Goal: 2 1 2 4 3 Wait for steady deck

Description: The pilot will maintain and fine tune his position while watching the motion of the ship This will continue until the ship finds a steady period and the pilot is ready for the next phase The NFP will continue his conning advisory as necessary unless the LSO is providing it over the radios or it is unnecessary

Completion Time: (seconds) 1000
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 3
Audition: 4
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1 Position of helicopter Global
2 Position of flight controls Global
3

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of position of flight controls
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 6 **Mission:** 7 **Efficiency:** 4 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2.1.2.4.3 Wait for steady deck

Description: The pilot will maintain and fine tune his position while watching the motion of the ship. This will continue until the ship finds a steady period and the pilot is ready for the next phase. The NFP will continue his conning advisory as necessary unless the LSO is providing it over the radios or it is unnecessary.

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowledge of ship and helo motion and
2 ability to predict them
3
4
5

Initiating Conditions

1 Helo in High Hover position
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Ship has found a steady period and pilot is ready to fly to Lo
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing

First Level: 2 2 Day Hauldown Landing

Second Level: 2 2 2 Position Helo for Hookup

Third Level: 2 2 2 4 Move Helo into High Hover

Source Goal: 2 2 2 4 1 Fly to hook-up position

Description: Pilot manoeuvres helo into hook-up position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally, the pilot will line up with the CIWS The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines

Completion Time: (seconds) 10

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None

Pyschomotor: 1 2 Spatial encoding

Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition

Audition: 2 Passive (pre-attentive) monitoring of auditory signals

Memory: 2 3 Spatial decoding

Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6

Audition: 4

Cogntive: 7

Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of position of flight controls
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 8 **Mission:** 8 **Efficiency:** 8 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 2 4 1 Fly to hook up position

Description: Pilot manoeuvres helo into hook up position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally, the pilot will line up with the CIWS The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines

Knowledge Requirements

Declarative

1 Helo operating procedures
2 SHOPS
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Signal Charlie has been given
2 Landing gear is down and locked
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo is in hook-up position
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Raise and lower collective while flying helo to position so as to maintain corree
2	Right Hand	Cyclic	Move stick right then centre to initiate motion right Then, move stick to the lef
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain correct heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 1 Fly Helo to Low Hover

Source Goal: 2 1 3 1 1 Fly to Low Hover

Description: When the deck is steady and the pilot is ready, he will fly the helo into the low hover This will be done by smoothly lowering the collective and applying pedal to prevent yaw The downwards motion should be smooth and as vertical as possible Lateral and longitudinal drift should be avoided As the helo reaches the low hover, the pilot will raise the collective to arrest descent The low hover position visual reference varies from pilot to pilot but generally the pilot will determine the helo's height by placing the windows in the hangar door against a spot on the windscreen This reference spot changes based on the pilot's size

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of position of flight controls
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 9 **Mission:** 9 **Efficiency:** 7 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 1 1 Fly to Low Hover

Description: When the deck is steady and the pilot is ready, he will fly the helo into the low hover This will be done by smoothly lowering the collective and applying pedal to prevent yaw The downwards motion should be smooth and as vertical as possible Lateral and longitudinal drift should be avoided As the helo reaches the low hover, the pilot will raise the collective to arrest descent The low hover position visual reference varies from pilot to pilot but generally the pilot will determine the helo's height by placing the windows in the hangar door against a spot on the windscreen This reference spot changes based on the pilot's size

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2 SHOPs
3
4
5

Situational

1 Knowledge of ship and helo motion and
2 and ability to predict them
3
4
5

Initiating Conditions

1 Ship has found a steady state
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo is positioned in Low Hover
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2.
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Lower collective to descend then raise to stop descent
2	Right Hand	Cyclic	Manipulate to maintain relative position of helo fore and aft, and left and right
3	Both Feet	Tail Rotor Pedals	Manipulate to prevent yaw and maintain appropriate heading
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 1 Call ready to land

Description: When the Pilot is ready, he will call over the radios "Ready to land" The Pilot will wait for a steady deck and fine tune his position prior to calling He will not call until he is comfortable with the helo and it's position Alternately, the pilot may flash his landing lights to signal ready to land

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of "Ready to land" message Global
2
3

Influenced Internal Variables

1 Perception of "Ready to land" message status
2
3

Output Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Input Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Goal Criticality

Safety: 5 **Mission:** 6 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2.1.3.3.1 Call ready to land

Description: When the Pilot is ready, he will call over the radios "Ready to land". The Pilot will wait for a steady deck and fine tune his position prior to calling. He will not call until he is comfortable with the helo and it's position. Alternately, the pilot may flash his landing lights to signal ready to land

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3 SHOPs
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3 Knowledge of ship and helo motion and
4 ability to predict them
5

Initiating Conditions

1 Helo in good position to land helo
2 Pilot is comfortable and confident of safe landing
3
4
5

Initiating Actions

1 Actuate radio switch
2 Actuate and cycle light switch on collective
3
4
5

Ending Conditions

1 Call is made
2
3
4
5

Ending Actions

1 Release radio switch
2 Stop cycling light switch
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Radio switch on cyclic	Actuate and hold
2	Left Hand	Light switch on collective	If required, the pilot will cycle light switch several times
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 2 Receive conning from LSO

Description: After calling ready to land, the LSO will provide conning instruction over the radio The commands will be "Ahead, Back, Left, Right, Up, Down, Steady" as required When the Pilot hears the conning instructions he will manoeuvre accordingly

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1.
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of relative position of ship and helo
3

Input Interface(s)

1 Radio(s)
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 7
Psychomotor: 0

Goal Criticality

Safety: 8 **Mission:** 6 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 1 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 2 Receive conning from LSO

Description: After calling ready to land, the LSO will provide conning instruction over the radio The commands will be "Ahead, Back, Left, Right, Up, Down, Steady" as required When the Pilot hears the conning instructions he will manoeuvre accordingly

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Pilot has called ready to land
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Executive has been given by LSO to land
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 3 Receive executive to land helo
Description: When the helo is in a good position and is ready to land the Pilot will receive the executive from the LSO "Land now, down, down, down"

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of landing status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 8 **Mission:** 8 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 3 Receive executive to land helo

Description: When the helo is in a good position and is ready to land the Pilot will receive the executive from the LSO "Land now, down, down, down"

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Helo in good position to land
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Call has been made
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 5 Land helo

Description: On receipt of landing clearance, pilot will lower the collective to place the helo into the RSD (rapid securing device) This should be a smooth but quick motion

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cognitive: 5
Psychomotor: 5

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Influenced Internal Variables

1 Perception of aircraft position in space
2 Perception of position of flight controls
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

Goal Criticality

Safety: 10 **Mission:** 10 **Efficiency:** 7 **Reliability:** 3 **Cost:** 9

Goal Criticality Rating: (GCR) 10

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 5 Land helo

Description: On receipt of landing clearance, pilot will lower the collective to place the helo into the RSD (rapid securing device). This should be a smooth but quick motion

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1 Comfort with position of helo and
2 confidence that landing will be successful
3
4
5

Initiating Conditions

1 Call to land has been made
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo is on deck
2
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Lower collective to land helo
2	Right Hand	Cyclic	Manipulate to maintain correct position over RSD
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 6 Receive call that helo is trapped and to lower tail probe
Description: When the helo has landed the pilot should receive a call from the LSO saying "In the trap, trapped, down tail probe"

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of relative position of ship and helo
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 3 **Reliability:** 1 **Cost:** 8
Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 6 Receive call that helo is trapped and to lower tail probe

Description: When the helo has landed the pilot should receive a call from the LSO saying "In the trap, trapped, down tail probe"

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3 Helo operating procedures
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Helo is on deck and trapped
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Call has been received
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 7 Lower tail probe

Description: On receipt of call from LSO to lower tail probe, the NFP will reach up to the hauldown panel and select the tail probe down switch The NFP should observe the light illuminate indicating the tail probe has successfully been lowered

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 3
Psychomotor: 4

Influenced External Variables

1 Position of tail probe Global
2
3

Influenced Internal Variables

1 Perception of tail probe position
2
3

Output Interface(s)

1 Tail probe switch
2
3
4
5

Input Interface(s)

1 Tail probe switch
2 Tail probe panel light
3
4
5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 2 **Reliability:** 2 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 7 Lower tail probe

Description: On receipt of call from LSO to lower tail probe, the NFP will reach up to the hauldown panel and select the tail probe down switch The NFP should observe the light illuminate indicating the tail probe has successfully been lowered

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 LSO has called to lower tail probe
2
3
4
5

Initiating Actions

1 Reach for tail probe down switch
2
3
4
5

Ending Conditions

1 Tail probe is lowered
2
3
4
5

Ending Actions

1 Release tail probe down switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Tail probe switch on haul-down pane	Actuate and hold switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 8 Receive call from LSO saying tail probe is down

Description: Pilot will receive a call over the radio from the LSO saying "On the rails" or "In the rails" indicating the tail probe has successfully been lowered

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of tail probe position
2
3

Input Interface(s)

1 Radio(s)
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 2
Psychomotor: 0

Goal Criticality

Safety: 3 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 8 Receive call from LSO saying tail probe is down

Description Pilot will receive a call over the radio from the LSO saying "On the rails" or "In the rails" indicating the tail probe has successfully been lowered

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Tail probe is on deck or in the rails
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Call has been received
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 9 Depress ASE switch
Description: When the probe is successfully lowered, the pilot will depress the ASE switch to turn it off

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 1
Audition: 0
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 ASE mode (on/off) Global
2
3

Influenced Internal Variables

1 Perception of ASE status
2
3

Output Interface(s)

1 ASE button
2
3
4
5

Input Interface(s)

1 ASE button
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 7
Limits: 0 **Improve:** 0

Goal Criticality Rating: (GCR) 5
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 9 Depress ASE switch

Description: When the probe is successfully lowered, the pilot will depress the ASE switch to turn it off

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo trapped on deck with tail probe lowered
2
3
4
5

Initiating Actions

1 Depress ASE switch
2
3
4
5

Ending Conditions

1 ASE is turned off
2
3
4
5

Ending Actions

1 Release ASE switch
2
3
4
5

Safework Data

	Body Part	**Target**	**Action**
1	Right Index Finger	ASE button on cyclic	Depress and release
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 3 Land Helo

Source Goal: 2 1 3 3 10 Observe trafficators are turned off
Description: Pilot will visually observe that all trafficator lights are extinguished

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of trafficators status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 1 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 1

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 1

Criticality Rationale:

The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 3 10 Observe trafficators are turned off

Description: Pilot will visually observe that all trafficator lights are extinguished

Knowledge Requirements

Declarative

1 SHOPs
2
3
4
5

Situational

1 Understanding significance of ships lights
2
3
4
5

Initiating Conditions

1 Helo on deck
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 1 Lower messenger

Description: Either on the call from the Pilot or automatically, the NFP will select the down switch on the Haul Down panel Generally, he will stay ready to deselect this switch at a moments notice

Completion Time: (seconds) 20

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Position of messenger Global
2
3

Output Interface(s)

1 Messenger switch
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of messenger position
2 Perception of messenger switch position
3

Input Interface(s)

1 Messenger switch
2
3
4
5

VACP Ratings

Vision: 0
Audition: 0
Cogntive: 2
Psychomotor: 4

Goal Criticality

Safety: 4 **Mission:** 8 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 1 Lower messenger

Description: Either on the call from the Pilot or automatically, the NFP will select the down switch on the Haul Down panel Generally, he will stay ready to deselect this switch at a moments notice

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1 Position of helicopter
2
3
4
5

Initiating Conditions

1 Helo is enroute to hook-up position or is in high hover position
2
3
4
5

Initiating Actions

1 Reach to Messenger down switch
2
3
4
5

Ending Conditions

1 LSO calls to stop lowering
2
3
4
5

Ending Actions

1 Release messenger down switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Messenger switch on haul down pan	Use pinch grip to select to down position and then release Switch will remain s
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 2 Receive call from LSO to stop lowering the messenger
Description: The call will come over the radio to "Stop Lowering"

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of messenger position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 3 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 2 Receive call from LSO to stop lowering the messenger

Description: The call will come over the radio to "Stop Lowering"

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Messenger cable is on deck
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Call has been received
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 4 Stop lowering the messenger
Description: The NFP will reach to the Haul-Down panel and select the Messenger switch to Off when the "Stop Lowering" call is received

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Position of messenger Global
2 Position of messenger switch Global
3

Output Interface(s)

1 Messenger switch
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of messenger position
2 Perception of messenger switch position
3

Input Interface(s)

1 Messenger switch
2
3
4
5

VACP Ratings

Vision: 0
Audition: 0
Cognitive: 0
Psychomotor: 2

Goal Criticality

Safety: 5 **Mission:** 3 **Efficiency:** 2 **Reliability:** 2 **Cost:** 5 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 4 Stop lowering the messenger

Description: The NFP will reach to the Haul Down panel and select the Messenger switch to Off when the "Stop Lowering" call is received

Knowledge Requirements

Declarative

1 Hauldown system operations
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Call to stop lowering has been received
2 Trafficator lights are switched to amber
3
4
5

Initiating Actions

1 Reach to messenger down switch
2
3
4
5

Ending Conditions

1 Call has been received
2
3
4
5

Ending Actions

1 Release messenger down switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Messenger switch on haul-down pan	Use pinch grip to move it to the centre position so as to deselect it
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 6 Receive call from LSO to raise the messenger
Description: Call comes over the radio from the LSO to "Raise the Messenger"

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of messenger position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 6 Receive call from LSO to raise the messenger

Description Call comes over the radio from the LSO to "Raise the Messenger"

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Messenger cable is hook-up up to hauldown cable
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Call has been received
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 8 Raise the messenger cable
Description: On receipt of "Raise the Messenger" call, NFP reaches up to the Haul Down panel and selects Up on the Messenger toggle switch

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 2
Audition: 0
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1	Position of messenger cable	Global
2	Position of messenger switch	Global
3		

Influenced Internal Variables

1 Perception of messenger cable position
2 Perception of messenger switch
3

Output Interface(s)

1 Messenger switch
2
3
4
5

Input Interface(s)

1 Messenger switch
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 3 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 8 Raise the messenger cable

Description: On receipt of "Raise the Messenger" call, NFP reaches up to the Haul-Down panel and selects Up on the Messenger toggle switch

Knowledge Requirements

Declarative

1 Hauldown system operations
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Call has been received to raise the messenger
2
3
4
5

Initiating Actions

1 Reach for messenger switch
2
3
4
5

Ending Conditions

1 Messenger is raised into helo
2
3
4
5

Ending Actions

1 Release messenger switch
2
3.
4
5

Safework Data

	Body Part	Target	Action
1.	Right Index Finger	Messenger switch on haul-down pan	Use pinch grip to select messenger switch to up position and then release when
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 9 Observe haul down panel lights cycling

Description: NFP observes the haul-down panel as the messenger raises into the helicopter and seats the ship's end fitting When the cycle is complete the NFP will observe on the haul-down panel that the tail probe light is up, the main probe light is down, the messenger light is separated, and the haul down cable light is locked in

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:	0	None
Pyschomotor:	0	None
Memory:	1	Memorization

Input/Sensation

Vision:	1 2	Spatial encoding, visual pattern recognition
Audition:	2	Passive (pre-attentive) monitoring of auditory signals
Memory:	2 4	Verbal decoding
Kinesthetic:	0	None

VACP Ratings

Vision:	3
Audition:	0
Cognitive:	2
Psychomotor:	0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of haul-down panel lights
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 9 Observe haul down panel lights cycling

Description: NFP observes the haul-down panel as the messenger raises into the helicopter and seats the ship's end fitting When the cycle is complete the NFP will observe on the haul-down panel that the tail probe light is up, the main probe light is down, the messenger light is separated, and the haul down cable light is locked in

Knowledge Requirements

Declarative

1 Hauldown system operations
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Messenger has been selected up
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Lights are three green
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

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ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 10 Call three green on the haul down panel

Description: When the NFP sees three green on the haul-down panel, he will call to the Pilot "Three green" This is the signal to indicate the helo is ready to accept haul down tension

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 1 Memorization

Input/Sensation

Vision: 2 Automatised, highly learned perception
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 4 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of trafficator status
2
3

Output Interface(s)

1 ICS switch on panel
2 ICS
3
4
5

Input Interface(s)

1 ICS switch on panel
2 ICS
3 External scene
4
5

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 10 Call three green on the haul down panel

Description: When the NFP sees three green on the haul-down panel, he will call to the Pilot "Three green" This is the signal to indicate the helo is ready to accept haul down tension

---

Knowledge Requirements

Declarative

1 Intercom system and operating procedures
2 Hauldown system operations
3
4
5

Situational

1
2
3
4.
5

Initiating Conditions

1 Messenger cable has been retracted
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Call has been made
2
3
4
5.

Ending Actions

1 Release ICS switch
2
3
4.
5

Safework Data

	Body Part	Target	Action
1	Left Index Finger	Intercom switch on left panel	Use pinch grip to actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 2 Wait for Hover Tension to be Applied

Source Goal: 2 2 3 2 1 Call LSO to inform three green on the panel

Description: When the NFP informs the Pilot that there are three green on the panel, the Pilot will call over the radio to the LSO saying "Three Green" This is the signal that the helo is ready to accept hover tension from the haul down

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of "Three Green" message Global
2
3

Influenced Internal Variables

1 Perception of "Three Green" message status
2
3

Output Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Input Interface(s)

1 Radio(s)
2 Radio switch on cyclic
3
4
5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 2 1 Call LSO to inform three green on the panel

Description: When the NFP informs the Pilot that there are three green on the panel, the Pilot will call over the radio to the LSO saying "Three Green" This is the signal that the helo is ready to accept hover tension from the haul down

---

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Understanding communications being passed over the
2 radio and how they affect the helicopter
3
4
5

Initiating Conditions

1 Lights are three green
2
3
4
5

Initiating Actions

1 Actuate radio switch
2
3
4
5

Ending Conditions

1 Call has been made
2
3
4
5

Ending Actions

1 Release radio switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Index Finger	Radio switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 4 Centre Helo when Tension Applied

Source Goal: 2 2 3 4 1 Sense centring force from hover tension being applied

Description: After calling three green the pilot awaits hover tension to be applied After about 5 seconds there will be a centring force as hover tension is applied

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 0 None
Memory: 0 None
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of hover tension
2 Perception of aircraft position
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

VACP Ratings

Vision: 0
Audition: 0
Cogntive: 0
Psychomotor: 5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 4 1 Sense centring force from hover tension being applied

Description: After calling three green the pilot awaits hover tension to be applied After about 5 seconds there will be a centring force as hover tension is applied

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1 Understanding that hauldown system is engaged with
2 hover tension applied
3
4
5

Initiating Conditions

1 Three green call has been made and received
2
3
4
5

Initiating Actions

1 Do nothing
2
3
4
5

Ending Conditions

1 Pilot centres helo over trap
2
3
4
5

Ending Actions

1 Stop attending to goal
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 4 Centre Helo when Tension Applied

Source Goal: 2 2 3 4 2 Centre over trap in high hover

Description: When hover tension is applied and the centring force is felt, the Pilot will gently move the helicopter over the RSD and find the normal centre line references for the high hover This means above the hangar so the horizon can be seen, lined up with the bum lines and the lines on the hangar face between his feet

Completion Time: (seconds) 4
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Influenced External Variables

1	Position of helicopter	Global
2	Position of flight controls	Global
3		

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of position of flight controls
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rotor pedals
4 External scene
5

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Goal Criticality

Safety: 6 **Mission:** 7 **Efficiency:** 5 **Reliability:** 2 **Cost:** 1 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GAL ANALYSIS: Part 2

Source Goal: 2 2 3 4 2 Centre over trap in high hover

Description: When hover tension is applied and the centring force is felt, the Pilot will gently move the helicopter over the RSD and find the normal centre line references for the high hover. This means above the hangar so the horizon can be seen, lined up with the bum lines and the lines on the hangar face between his feet

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1
2
3
4.
5

Initiating Conditions

1 Centring force is sensed
2
3
4
5

Initiating Actions

1 Apply flight control inputs
2
3
4
5

Ending Conditions

1 Helo is centred over trap
2.
3
4
5

Ending Actions

1 Stop applying flight control inputs
2
3.
4.
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Manipulate to maintain correct altitude
2	Right Hand	Cyclic	Manipulate to ease the helicopter left and into position over RSD
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 5 Observe deck crew moving under the helo
Description: Pilot will visually observe the deck crew moving under the helo to hook up the hauldown cable

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cognitive: 6
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of crew position(s)
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 5 Observe deck crew moving under the helo

Description: Pilot will visually observe the deck crew moving under the helo to hook up the hauldown cable

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Messenger cable has been lowered to deck
2
3
4
5.

Initiating Actions

1 Visually scan deck area
2
3.
4
5

Ending Conditions

1 Deck crew under helo
2
3
4
5

Ending Actions

1 Stop scanning deck area
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 12 Observe deck crew moving out from under helo
Description: Pilot will visually observe the two deck crew members moving under the helo to hook up the messenger to the hauldown cable

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 6
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of deck crew position(s)
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

- This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 12 Observe deck crew moving out from under helo

Description: Pilot will visually observe the two deck crew members moving under the helo to hook up the messenger to the hauldown cable

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Understanding what deck crew is doing
2
3
4
5

Initiating Conditions

1 Haul down cable has been hooked up to messenger cable
2
3
4
5.

Initiating Actions

1 Scan external scene, esp deck area
2
3
4
5

Ending Conditions

1 Deck crew has retreated into the hangar
2
3
4
5

Ending Actions

1 Stop scanning deck area
2.
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach

First Level: 1 1 Day Approach

Second Level: 1 1 1 Prepare Helo for Approach and Landing

Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 3 Request pre landing checklist be completed

Description: Pilot will use the ICS to call the NFP to request checks to be completed or other action be done such as lowering landing gear or changing radio frequencies

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production

Pyschomotor: 1 1 Automatised, highly learned

Memory: 0 None

Input/Sensation

Vision: 0 None

Audition: 2 Passive (pre-attentive) monitoring of auditory signals

Memory: 2 2 Verbal decoding

Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0

Audition: 2

Cogntive: 2

Psychomotor: 2

Influenced External Variables

1 Status of pre landing checklist request Global
2
3

Influenced Internal Variables

1 Perception of pre landing checklist request stat
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 8 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 3 Request pre landing checklist be completed

Description: Pilot will use the ICS to call the NFP to request checks to be completed or other action be done such as lowering landing gear or changing radio frequencies

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot has a need for the NFP
2
3
4
5

Initiating Actions

1 Depress ICS Switch
2
3
4
5

Ending Conditions

1 Pilot has communicated to NFP
2
3
4
5

Ending Actions

1 Release ICS Switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Foot	ICS switch on cyclic	Depress switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 5 Receive report that pre landing checklist is complete
Description: Pilot receives call over ICS from NFP that requested checks or other actions have been successfully completed

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of pre landing checklist status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 5 Receive report that pre landing checklist is complete

Description: Pilot receives call over ICS from NFP that requested checks or other actions have been successfully completed

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP has completed checks or other actions
2
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Pilot has received comms from NFP
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 6 Monitor Radios

Completion Time: (seconds) 1000

Description: All aircrew listen out on radios to listen for other stations calling the helo, to gain an appreciation of the air picture for safety purposes, and to gain tactical knowledge of situation

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 0
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of radio message content
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 6 **Efficiency:** 1 **Reliability:** 1 **Cost:** 3 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 6 Monitor Radios

Description: All aircrew listen out on radios to listen for other stations calling the helo, to gain an appreciation of the air picture for safety purposes, and to gain tactical knowledge of situation

Knowledge Requirements

Declarative

1 Radio system operations
2
3
4
5

Situational

1 Understanding communications being passed over the
2 and how they apply to the specific situation
3.
4
5

Initiating Conditions

1
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 7 Maintain desired condition of flight

Description: Pilot will operate controls so as to maintain the helicopter in the desired condtion of flight whether that is straight and level, in a climb, descent, turn, etc

Completion Time: (seconds) 1000

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 1 Memorization

Influenced External Variables

1	Aircraft position	Global
2	Position of flight controls	Global
3		

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight controls position
3

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

VACP Ratings

Vision: 6
Audition: 0
Cognitive: 7
Psychomotor: 5

Goal Criticality

Safety: 7 **Mission:** 6 **Efficiency:** 3 **Reliability:** 1 **Cost:** 8 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 7 Maintain desired condition of flight

Description: Pilot will operate controls so as to maintain the helicopter in the desired condition of flight whether that is straight and level, in a climb, descent, turn, etc

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1 Understanding position and what condition
2 of flight is to be maintained
3
4
5

Initiating Conditions

1
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Change position of collective to maintain aircraft in desired condition of flight
2	Right Hand	Cyclic	Change position of cyclic to maintain aircraft in desired condition of flight
3	Both Feet	Tail Rotor Pedals	Change position of pedals to maintain aircraft in desired condition of flight
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 5 Check tail wheel is locked

Description: As non flying pilot calls out items on the checklist he will ask pilot (assuming he is in right seat) to check tail wheel is locked Pilot will visually observe the Tail Wheel Locked light is lit on the advisory panel and the tail wheel handle is in the locked position Pilot will verbally confirm locked condition

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 0 None

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of tail wheel status/position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Advisory panel
2 Tail wheel handle
3
4
5

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 2 **Reliability:** 2 **Cost:** 3 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal:	1 1 1 4 5 Check tail wheel is locked
Description:	As non flying pilot calls out items on the checklist he will ask pilot (assuming he is in right seat) to check tail wheel is locked Pilot will visually observe the Tail Wheel Locked light is lit on the advisory panel and the tail wheel handle is in the locked position Pilot will verbally confirm locked condition

---

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Panel checklist is initiated
2
3
4
5

Initiating Actions

1 Visually sight advisory panel and tail wheel handle
2
3
4
5

Ending Conditions

1 Panel and handle confirmed
2
3
4
5

Ending Actions

1 Tail wheel locked is confirmed
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Tail Wheel Handle	If not locked, pilot will reach down and raise tail wheel lock handle to the up p
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 6 Check brakes are set

Description: After the panel checklist is initiated and the tail wheel has been confirmed locked the next item on the list is to confirm the brakes are set The flying pilot, if in the right seat, will confirm the brake handle is in the locked position and the Brake Set light is illuminated on the advisory panel He will verbally confirm this state over the ICS

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:
Pyschomotor:
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 0
Cognitive: 0
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of brake status/position
2
3

Output Interface(s)

1
2
3
4.
5

Input Interface(s)

1 Brake handle
2 Brake set light
3
4
5

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 6 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 6 Check brakes are set

Description: After the panel checklist is initiated and the tail wheel has been confirmed locked the next item on the list is to confirm the brakes are set The flying pilot, if in the right seat, will confirm the brake handle is in the locked position and the Brake Set light is illuminated on the advisory panel He will verbally confirm this state over the ICS

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Tail wheel locked check is complete
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Brakes are confirmed set
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Brake handle	If required, pull up on handle to lock brakes Brakes must be depressed first
2	Both Feet	Brake part of tail rotor pedals	Depress brakes prior to pulling handle to set them
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 7 Call AESOP for sonar check
Description: Non flying pilot will call AESOP to confirm status of Sonar

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of call for sonar check Global
2
3

Influenced Internal Variables

1 Perception of call for sonar check status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 5 **Mission:** 4 **Efficiency:** 4 **Reliability:** 1 **Cost:** 6 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 7 Call AESOP for sonar check

Description: Non flying pilot will call AESOP to confirm status of Sonar

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Brakes have been confirmed set
2
3
4
5

Initiating Actions

1 NFP calls AESOP over ICS
2
3
4.
5

Ending Conditions

1 AESOP called with request to check sonar
2
3
4
5

Ending Actions

1 AESOP called over ICS
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Radio panel	Depress ICS switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 8 Receive confirmation from AESOP that sonar is "Seated and Sighted
Description: AESOP will call back over ICS confirming sonar is "Seated and Sighted"

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition. 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of sonar status
2
3

Input Interface(s)

1 ICS
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 8 Receive confirmation from AESOP that sonar is "Seated and Sighted

Description: AESOP will call back over ICS confirming sonar is "Seated and Sighted"

Knowledge Requirements

Declarative

1 *Helo operating procedures*
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 AESOP has been requested to conduct sonar check
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Call is received from AESOP
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 9 Check throttles set to full
Description: NFP will check that throttles are set to full as last item of panel check list

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:
Pyschomotor:
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 0 None

VACP Ratings

Vision: 4
Audition: 0
Cognitive: 2
Psychomotor: 0

Influenced External Variables

1
2.
3

Influenced Internal Variables

1 Perception of throttle status/position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Throttles
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 3 **Efficiency:** 7 **Reliability:** 1 **Cost:** 8 **Goal Criticality Rating: (GCR)** 9

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 9

Criticality Rationale:

This task has high potential to adversely affect Safety, Efficiency, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 9 Check throttles set to full

Description: NFP will check that throttles are set to full as last item of panel check list

---

Knowledge Requirements

Declarative

1 Helo operating procedures
2.
3
4
5.

Situational

1
2
3
4
5

Initiating Conditions

1 Sonar checked and acknowledged by AESOP
2
3
4
5.

Initiating Actions

1 NFP reaches up to SSL's
2
3
4
5

Ending Conditions

1 SSL's are set to full forward
2
3
4
5

Ending Actions

1 NFP releases SSL's
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Speed Selector Levers	NFP will reach up and physically check that throttles are set to their full forwar
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 10 Inform AESOP winch to be lowered
Description: Non flying pilot will inform AESOP over ICS that winch is to be lowered

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of "Winch to be lowered" message Global
2
3

Influenced Internal Variables

1 Perception of "Winch to be lowered" message s
2
3

Output Interface(s)

1 ICS
2. ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 7 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 3
Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 10 Inform AESOP winch to be lowered

Description: Non flying pilot will inform AESOP over ICS that winch is to be lowered

---

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1 Knowledge of AESOP's location in helo
2
3
4
5

Initiating Conditions

1 Throttles have been set to full
2
3
4
5

Initiating Actions

1 Call AESOP on ICS
2
3
4
5

Ending Conditions

1 AESOP informed to clear fingers from winch
2
3
4
5

Ending Actions

1 Finish calling AESOp
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS switch on radio panel	Depress switch and hold to call AESOp
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 11 Receives call from AESOP that fingers are clear of the winch

Description: After informing AESOP that winch is to be lowered, non flying pilot awaits acknowledgement from AESOP before lowering winch This is to ensure safety and that AESOP is not being endagered

Completion Time: (seconds) 2
Feedback to Higher Level Goal: 3

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of winch status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 11 Receives call from AESOP that fingers are clear of the winch

Description: After informing AESOP that winch is to be lowered, non flying pilot awaits acknowledgement from AESOP before lowering winch. This is to ensure safety and that AESOP is not being endagered

---

Knowledge Requirements

Declarative

1.
2
3
4
5

Situational

1
2.
3.
4
5

Initiating Conditions

1 Call has been made to AESOP to clear from winch area
2
3
4
5

Initiating Actions

1
2
3
4.
5.

Ending Conditions

1 Call received from AESOP
2.
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 12 Lower winch and verifies light illuminated on haul down panel
Description: NFP will reach to hauldown panel and lower winch for landing

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Influenced External Variables

1 Position of winch Global
2 Position of winch control Global
3

Output Interface(s)

1 Winch control
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of winch position
2 Perception of winch control position
3

Input Interface(s)

1 Winch control
2
3
4
5

VACP Ratings

Vision: 4
Audition: 0
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 8 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 12 Lower winch and verifies light illuminated on haul down panel

Description: NFP will reach to hauldown panel and lower winch for landing

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Throttles are confirmed at full
2
3
4
5

Initiating Actions

1 NFP reaches to haul down panel and lowers winch
2
3
4
5

Ending Conditions

1 Winch is in lowered position
2
3
4
5

Ending Actions

1 NFP removes hand from panel
2.
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Winch button on haul down panel	Reach to hauldown panel and move switch to down position until light illumun
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 4 Complete Panel Checklist

Source Goal: 1 1 1 4 13 Verify tail probe is up
Description: NFP will confirm tail probe is up by visually checking the haul down panel

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:
Pyschomotor:
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of tail probe position
2
3

Input Interface(s)

1 Haul down panel
2
3
4
5

VACP Ratings

Vision: 4
Audition: 0
Cognitive. 2
Psychomotor: 0

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 5
Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 4 13 Verify tail probe is up

Description: NFP will confirm tail probe is up by visually checking the haul down panel

---

Knowledge Requirements

Declarative

1. Helo operating procedures
2
3
4.
5

Situational

1
2
3
4
5

Initiating Conditions

1 Winch has been lowered as part of panel checklist
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Tail probe up is verified
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Haul down panel	Sight light indicating tail probe is up
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 2 Fly Approach
Third Level: 1 1 2 1 Fly Approach

Source Goal: 1 1 2 1 4 Receive safe single engine speed
Description: NFP will calculate safe single engine speed and pass this number to pilot

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of safe single engine speed
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 2 **Efficiency:** 6 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 2 1 4 Receive safe single engine speed

Description: NFP will calculate safe single engine speed and pass this number to pilot

Knowledge Requirements

Declarative

1 Helo operating procedures
2 Air temperature
3 Helo weight
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 SSES calculated
2
3
4
5

Initiating Actions

1 Depress ICS switch to call pilot
2
3
4.
5

Ending Conditions

1 SSES passed to pilot
2
3
4
5

Ending Actions

1 Release ICS switch when finished speaking
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS switch on radio panel	Depress switch to call pilot
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 1 Prepare Helo for Approach and Landing
Third Level: 1 2 1 3 Plan Approach

Source Goal: 1 2 1 3 5 Receive briefing on approach plan
Description: NFP will listen to pilot as he briefs approach plan

Completion Time: (seconds) 15
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition. 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of approach plan
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 1 3 5 Receive briefing on approach plan

Description: NFP will listen to pilot as he briefs approach plan

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Understanding of state of helo and operating
2 parameters
3
4
5

Initiating Conditions

1 Pilot will transmit over ICS
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Pilot will cease transmitting over ICS
2
3.
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 2 Fly Approach
Third Level: 1 2 2 1 Fly Approach

Source Goal: 1 2 2 1 18 Receive call to cease reporting
Description: Non flying pilot receives call from pilot over ICS to cease reporting

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables
1
2
3

Influenced Internal Variables
1 Perception of reporting status
2
3

Output Interface(s)
1
2
3
4
5

Input Interface(s)
1 ICS
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 1 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 2 1 18 Receive call to cease reporting

Description: Non flying pilot receives call from pilot over ICS to cease reporting

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot calls over ICS
2
3
4
5.

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Pilot stops calling
2
3
4
5

Ending Actions

1
2
3
4.
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 9 Receive confirmation of left hand bug light
Description: When NFP calls over ICS to confirm left hand bug light, pilot receives call

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of left hand bug light status
2
3

Input Interface(s)

1 ICS
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 9 Receive confirmation of left hand bug light

Description: When NFP calls over ICS to confirm left hand bug light, pilot receives call

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4.
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP checks left hand bug light
2
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Pilot receives call from NFP
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1.			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level:	2 Landing
First Level:	2 1 Day Freedeck Landing
Second Level:	2 1 2 Position Helo for Landing
Third Level:	2 1 2 3 Lower Landing Gear

Source Goal: 2 1 2 3 11 Receive gear down and locked call

Description: After bug lights, panel indicators, and landing gear handle and lights have been confirmed, NFP will call gear down and locked over ICS, which pilot will receive

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:	0	None
Pyschomotor:	0	None
Memory:	1	Memorization

Input/Sensation

Vision:	0	None
Audition:	5	Verbal decoding speech recognition
Memory:	2 2	Verbal decoding
Kinesthetic:	0	None

VACP Ratings

Vision:	0
Audition:	4
Cognitive:	5
Psychomotor:	0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of landing gear status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 3 11 Receive gear down and locked call

Description: After bug lights, panel indicators, and landing gear handle and lights have been confirmed, NFP will call gear down and locked over ICS, which pilot will receive

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP calling gear down and locked
2
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Pilot receives call from NFP
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 4 Move Helo into High Hover

Source Goal: 2 1 2 4 6 Guard throttle

Completion Time: (seconds) 30

Feedback to Higher Level Goal: ☐

Description: As pilot moves helo over flight deck, NFP will move his right hand to guard both speed selector levers The purpose of this is to prevent any accidental loss of power through the throttles vibrating back from full power This is not a required action but only a best practice Hand may be removed to operate other controls and radio as required

Output/Behaviour

Voice:
Pyschomotor: 1 1 Automatised, highly learned
Memory:

Input/Sensation

Vision: 2 Automatised, highly learned perception
Audition:
Memory:
Kinesthetic:

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 0
Psychomotor: 4

Influenced External Variables

1 Hand position Local
2
3

Influenced Internal Variables

1 Perception of hand position
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 1 **Efficiency:** 1 **Reliability:** 2 **Cost:** 4 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 4 6 Guard throttle

Description: As pilot moves helo over flight deck, NFP will move his right hand to guard both speed selector levers The purpose of this is to prevent any accidental loss of power through the throttles vibrating back from full power This is not a required action but only a best practice Hand may be removed to operate other controls and radio as required

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowledge of specific helicopter characteristics
2
3
4
5

Initiating Conditions

1 Pilot flies helo over deck
2
3
4
5

Initiating Actions

1 Move hand to guard throttles
2
3
4
5

Ending Conditions

1 Helo on deck
2
3
4
5

Ending Actions

1 Remove hand from throttles
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Speed selector levers	Move hand to hold both throttles
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 3 Land Helo
Third Level: 2 1 3 2 Position Helo and Await the Deck

Source Goal: 2 1 3 2 4 Receive conning advisory

Description: Pilot will receive conning advisory from NFP when the helo is over the flight deck and is out of position The calls over the ICS will consist of Up, Down, Left, Right, Ahead, Back, and Steady The NFP may also call Good Positon

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of relative aircraft position
2 Perception of required position correction
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 7 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 3 2 4 Receive conning advisory

Description: Pilot will receive conning advisory from NFP when the helo is over the flight deck and is out of position The calls over the ICS will consist of Up, Down, Left, Right, Ahead, Back, and Steady The NFP may also call Good Positon

Knowledge Requirements

Declarative

1 Shops
2
3
4
5

Situational

1. Understanding of ship and flight deck position and
2 movement of helo relative to it
3
4
5

Initiating Conditions

1 Helo over flight deck
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Helo on flight deck
2 Helo away from ship
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 1 Sense control malfunction

Description: While flying aircraft pilot will sense an ASE malfuntion by a perceived loss of stability, particularly in roll and pitch If pilot is flying smoothly and coordinated loss of ASE may not be immediately apparent

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:
Pyschomotor:
Memory:

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of aircraft safety
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 Flight instruments
5 External scene

Goal Criticality

Safety: 10 **Mission:** 9 **Efficiency:** 7 **Reliability:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 1 Sense control malfunction

Description: While flying aircraft pilot will sense an ASE malfuntion by a perceived loss of stability, particularly in roll and pitch If pilot is flying smoothly and coordinated loss of ASE may not be immediately apparent

Knowledge Requirements

Declarative

1 Helo emergency procedures
2
3
4
5

Situational

1 Helo control characteristics
2
3
4
5

Initiating Conditions

1 Controls malfunction
2 Pilot modifies flying technique to account for extra sensitivity r
3
4
5

Initiating Actions

1. Apply control inputs
2
3
4
5

Ending Conditions

1 Pilot senses control malfunction
2.
3
4
5

Ending Actions

1 Stop applying control inputs
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Provide smooth control inputs to maintain stability and safety of flight
2	Right Hand	Cyclic	Provide smooth control inputs to maintain stability and safety of flight
3	Both Feet	Pedals	Provide smooth control inputs to maintain stability and safety of flight
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach

First Level: 1 3 Troubleshoot Failures during Approach

Second Level: 1 3 1 Troubleshoot ASE Failure

Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 3 Call for full power both

Description: Pilot will call for full power both to non flying pilot This is to signal NFP to bring both speed selector levers to full forward postion This is generally the first action a pilot will do when an emergency manifests itself It signals the crew to an unusual situation

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production

Pyschomotor: 1 1 Automatised, highly learned

Memory: 0 None

Input/Sensation

Vision: 0 None

Audition: 2 Passive (pre-attentive) monitoring of auditory signals

Memory: 2 2 Verbal decoding

Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0

Audition: 2

Cogntive: 2

Psychomotor: 2

Influenced External Variables

1 Status of "Full Power Both" message Global
2
3

Influenced Internal Variables

1 Perception of "Full Power Both" message statu
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5.

Goal Criticality

Safety: 9 **Mission:** 5 **Efficiency:** 8 **Reliability:** 1 **Cost:** 9

Goal Criticality Rating: (GCR) 10

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 3 Call for full power both

Description: Pilot will call for full power both to non flying pilot This is to signal NFP to bring both speed selector levers to full forward postion This is generally the first action a pilot will do when an emergency manifests itself It signals the crew to an unusual situation

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowledge that there is some sort of malfunction
2 of the helo
3
4
5

Initiating Conditions

1 An emergency situation arises
2
3
4
5

Initiating Actions

1 Depress ICS switch
2
3
4
5

Ending Conditions

1 Call for full power both made
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	ICS switch on cyclic	Depress switch to make call
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 4 Receive call for full power both
Description: Non flying pilot receives call for full power both

Completion Time: (seconds) 3
Feedback to Higher Level Goal: [illegible]

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of power requirements
2
3

Input Interface(s)

1 ICS
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Goal Criticality

Safety: 9 **Mission:** 7 **Efficiency:** 9 **Reliabihty:** 1 **Cost:** 9 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 4 Receive call for full power both

Description: Non flying pilot receives call for full power both

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 An emergency situation has arose and pilot has called for
2 full power both on throttles
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Call is received
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 6 Confirm full power both
Description: When throttles are set to full, non flying pilot confirms over ICS to pilot of the fact

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of "Full power both" message Global
2
3

Influenced Internal Variables

1 Perception of "Full power both" message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 6 **Mission:** 2 **Efficiency:** 8 **Reliability:** 1 **Cost:** 3 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Efficiency if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 6 Confirm full power both

Description: When throttles are set to full, non flying pilot confirms over ICS to pilot of the fact

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 SSL's are set to full
2
3
4
5

Initiating Actions

1 Depress ICS switch
2
3
4
5

Ending Conditions

1 Pilot informed
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS switch on radio panel	Depress switch to make call
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 7 Receive confirmation of full power both
Description: Pilot receives ICS call from non flying pilot confirming throttles are set to full power

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of power settings
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 1 **Efficiency:** 5 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Efficiency if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1.3.1.1.7 Receive confirmation of full power both

Description: Pilot receives ICS call from non flying pilot confirming throttles are set to full power

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP makes call over ICS
2
3
4
5.

Initiating Actions

1
2
3.
4
5

Ending Conditions

1 NFP completes call
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 8 Overshoot approach

Description: If the helo is not is a position to affect a landing, the ship is not spotted, the helo is waved off, or any other saftey concerns become apparent, any one in the crew or even externally over the radio may call for an overshoot from an approach. The pilot will initiate a climb to 200 feet and turn away from the ship to the predetermined overshoot heading (aprox 30 degs from flying course of ship into wind)

Completion Time: (seconds) 30
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:
Pyschomotor: 1 2 Spatial encoding
Memory:

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Aircraft position	Global
2	Flight control(s) position	Global
3		

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control(s) position
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Inpu. Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 9 **Mission:** 8 **Efficiency:** 6 **Reliability:** 1 **Cost:** 9

Goal Criticality Rating: (GCR) 10

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 8 Overshoot approach

Description: If the helo is not is a position to affect a landing, the ship is not spotted, the helo is waved off, or any other saftey concerns become apparent, any one in the crew or even externally over the radio may call for an overshoot from an approach The pilot will initiate a climb to 200 feet and turn away from the ship to the predetermined overshoot heading (aprox 30 degs from flying course of ship into wind)

Knowledge Requirements

Declarative

1 Helo operating procedures
2
3
4
5

Situational

1 Knowing where helo and ship are relative to one
2 another
3.
4
5

Initiating Conditions

1 Ship not spotted
2 Helo not in a position to conduct landing
3 Helo waved off
4 Other safety concers or malfunctions
5

Initiating Actions

1 Pilot or other crew calls overshoot
2
3
4
5

Ending Conditions

1 Helo completes overshoot procedure
2
3
4
5.

Ending Actions

1 Pilot levels off helo and establishes new course and speed
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Operate collective to fly overshoot procedure
2	Right Hand	Cyclic	Operate cyclic to fly overshoot procedure
3	Both Feet	Tail Rotor Pedals	Operate pedals to fly overshoot procedure
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 11 Explain indications to crew
Description: After helo established in a safe regime of flight pilot will brief crew on what happened

Completion Time: (seconds) 15
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of control failure briefing Global
2
3

Influenced Internal Variables

1 Perception of control failure briefing status
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 3

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 11 Explain indications to crew

Description: After helo established in a safe regime of flight pilot will brief crew on what happened

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Understanding of what went wrong
2
3
4
5

Initiating Conditions

1 Helo overshot from approach
2
3
4
5

Initiating Actions

1 Depress switch on ICS to brief crew
2
3
4
5

Ending Conditions

1 Crew briefed
2
3
4
5

Ending Actions

1 Release switch on ICS
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	ICS switch on cyclic	Depress switch to talk
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 12 Receive briefing on malfunction indications
Description: NFP will examine ASE system and then inform the Pilot and crew of his findings

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of malfunction indicators
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 8 **Efficiency:** 7 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 12 Receive briefing on malfunction indications

Description: NFP will examine ASE system and then inform the Pilot and crew of his findings

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1. Pilot has requested the NFP to examine the ASE system
2
3
4
5

Initiating Actions

1 Switch hover indicator to A mode
2. Check ASE control panel
3
4
5

Ending Conditions

1 Pilot has been informed of situation
2
3
4.
5

Ending Actions

1 None
2
3.
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 17 Inform crew on hover indicator status

Description: NFP will examine all relevant inputs to troubleshoot ASE malfunctions Specifically, he will begin by examining the ASE panel to see if the light is illuminated the will examine the A mode of the hover indicator looking for off flags or other strange movement of the bars He will then inform the pilot of his findings

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of hover indicator message Global
2
3

Influenced Internal Variables

1 Perception of hover indicator message status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 4 **Mission:** 2 **Efficiency:** 3 **Reliability:** 1 **Cost:** 2 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 17 Inform crew on hover indicator status

Description: NFP will examine all relevant inputs to troubleshoot ASE malfunctions Specifically, he will begin by examining the ASE panel to see if the light is illuminated the will examine the A mode of the hover indicator looking for off flags or other strange movement of the bars He will then inform the pilot of his findings

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Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot has requested ASE system to be examined
2 ASE System has been examined
3
4
5

Initiating Actions

1 Depress ICS switch
2
3
4
5

Ending Conditions

1 Pilot and crew informed
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS switch on side com panel	Depress switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 18 Receive hover indicator status

Description: NFP reports to Pilot what the hover indicator is indicating He is specifically looking for off flag indications or abnormal bar movements where they are either still in the middle of fully deflected to one side

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of hover indicator status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 4 **Mission:** 5 **Efficiency:** 5 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 6
Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 6

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Mission Effectiveness/Completion, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 18 Receive hover indicator status

Description: NFP reports to Pilot what the hover indicator is indicating He is specifically looking for off flag indications or abnormal bar movements where they are either still in the middle of fully deflected to one side

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1. NFP has examined the hover indicator
2
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Pilot has been informed
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1.			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 19 Observe circuit breaker status

Description: On request of Pilot to examine ASE system, NFP will look at all circuit breaker panels to see if there are any popped ones He will specifically look at the overhead panel for the ASE circuit breaker

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:
Pyschomotor:
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition:
Memory: 2 1 Automatised
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of circuit breaker status
2
3

Input Interface(s)

1 Circuit breaker panel
2
3
4
5

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 2
Psychomotor: 0

Goal Criticality

Safety: 5 **Mission:** 8 **Efficiency:** 2 **Reliability:** 2 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 19 Observe circuit breaker status

Description: On request of Pilot to examine ASE system, NFP will look at all circuit breaker panels to see if there are any popped ones. He will specifically look at the overhead panel for the ASE circuit breaker

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot has requested ASE to be examined
2
3
4
5

Initiating Actions

1 Look at circuit breaker panels
2
3
4
5

Ending Conditions

1 Circuit breaker panels have been examined
2
3
4
5

Ending Actions

1 Look back ahead
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Circuit breaker panels	Look at panels above and below
2			
3			
4			

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ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 20 Report circuit breaker status
Description: NFP will call Pilot over ICS to inform him of his findings in regards to the status of the circuit breaker panels

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised; highly learned
Memory: 0 None

Influenced External Variables

1 Status of circuit breaker message Global
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised; highly learned perception

Influenced Internal Variables

1 Perception of circuit breaker message status
2
3

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 3 **Mission:** 4 **Efficiency:** 5 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Efficiency if improperly performed. The demands of this task do not approach human performance limits. Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 20 Report circuit breaker status

Description: NFP will call Pilot over ICS to inform him of his findings in regards to the status of the circuit breaker panels

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP has examined circuit breaker panel
2
3
4
5

Initiating Actions

1 Depress ICS switch
2.
3
4
5

Ending Conditions

1 Pilot has been informed of circuit breaker panel status
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS switch on side com panel	Depress switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 21 Receive circuit breaker status
Description: Pilot will receive call from NFP regarding the status of the circuit breaker panel

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of circuit breaker status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 5 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 21 Receive circuit breaker status

Description: Pilot will receive call from NFP regarding the status of the circuit breaker panel

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP was requested to check circuit breaker panel
2 NFP checked circuit breaker panel
3
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Pilot has been informed of status of circuit breaker panel
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 24 Depress ASE button

Description: NFP reaches down to the centre instrument console and depresses the ASE switch to try and engage the system If the button illuminates green the the system is engaged This can be confirmed by examining the hover indicator in A mode looking for off flags

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:
Pyschomotor: 1 1 Automatised, highly learned
Memory:

Influenced External Variables

1 ASE Status (on/off) Global
2
3

Output Interface(s)

1 ASE Button
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of ASE status
2
3

Input Interface(s)

1 ASE button
2 Hover A indicator
3
4
5

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 2
Psychomotor: 2

Goal Criticality

Safety: 4 **Mission:** 7 **Efficiency:** 3 **Reliability:** 2 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 24 Depress ASE button

Description: NFP reaches down to the centre instrument console and depresses the ASE switch to try and engage the system If the button illuminates green the the system is engaged This can be confirmed by examining the hover indicator in A mode looking for off flags

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 ASE is required and Pilot has requested it
2
3
4
5

Initiating Actions

1 Depress and release ASE button
2
3
4
5

Ending Conditions

1 ASE is engaged
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	ASE control panel - On/Off button	Depress
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach

First Level: 1 3 Troubleshoot Failures during Approach

Second Level: 1 3 1 Troubleshoot ASE Failure

Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 25 Inform crew ASE failed to reset

Description: After NFP has attempted to reset the ASE and it has failed, he will inform the crew of this failure over the ICS

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production

Pyschomotor: 1 1 Automatised, highly learned

Memory:

Input/Sensation

Vision: 0 None

Audition: 2 Passive (pre-attentive) monitoring of auditory signals

Memory: 2 2 Verbal decoding

Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0

Audition: 2

Cognitive: 2

Psychomotor: 2

Influenced External Variables

1 Status of message re ASE reset Global
2
3

Influenced Internal Variables

1 Perception of ASE reset message status
2
3

Output Interface(s)

1 ICS switch
2 ICS
3
4
5

Input Interface(s)

1 ICS switch
2 ICS
3
4
5

Goal Criticality

Safety: 2 **Mission:** 2 **Efficiency:** 5 **Reliability:** 2 **Cost:** 2

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 25 Inform crew ASE failed to reset

Description: After NFP has attempted to reset the ASE and it has failed, he will inform the crew of this failure over the ICS

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 NFP has attempted to reset the ASE system
2
3
4
5

Initiating Actions

1 Depress ICS switch
2
3
4
5

Ending Conditions

1 Pilot and crew informed of ASE system status
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS Switch on side com panel	Depress switch
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 27 Inform LSO of situation and requests constant tension hauldown

Description: After troubleshooting has been completed and the ASE sytem will not restore itself, the Pilot will discuss options with the crew The decision will be made to return to the ship at which point he will call the LSO informing him of the status of the helo and the helos intentions for recovery For this sort of a malfunction it is customary to request a contant tension hauldown for recovery

Completion Time: (seconds) 10

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Status of hauldown request Global
2
3

Output Interface(s)

1 Radio
2 Radio switch on cyclic
3
4
5

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of hauldown request status
2
3

Input Interface(s)

1 Radio
2 Radio switch on cyclic
3
4
5

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Goal Criticality

Safety: 4 **Mission:** 5 **Efficiency:** 5 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 6

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 6

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Mission Effectiveness/Completion, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 27 Inform LSO of situation and requests constant tension hauldown

Description: After troubleshooting has been completed and the ASE sytem will not restore itself, the Pilot will discuss options with the crew The decision will be made to return to the ship at which point he will call the LSO informing him of the status of the helo and the helos intentions for recovery For this sort of a malfunction it is customary to request a contant tension hauldown for recovery

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4.
5

Initiating Conditions

1 Recovery options discussed with crew
2 ASE will not reset
3
4
5

Initiating Actions

1 Depress radio switch
2
3
4
5

Ending Conditions

1 LSO informed of situation
2 Request for recover made
3
4
5

Ending Actions

1. Release radio switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Radio switch on cyclic	Depress and speak
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 34 Re-confirm numbers for recovery with LSO
Description: Pilot will call LSO to request updated numbers for recovery

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of "Recovery Numbers" message Global
2
3

Influenced Internal Variables

1 Perception of "Recovery Numbers" message sta
2
3

Output Interface(s)

1 Radio
2 Radio switch on cyclic
3
4
5

Input Interface(s)

1 Radio
2 Radio switch on cyclic
3
4
5

Goal Criticality

Safety: 4 **Mission:** 4 **Efficiency:** 5 **Reliability:** 1 **Cost:** 2 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 34 Re-confirm numbers for recovery with LSO

Description: Pilot will call LSO to request updated numbers for recovery

---

Knowledge Requirements

Declarative

1
2.
3
4
5

Situational

1.
2
3
4
5

Initiating Conditions

1 Helo returning for recovery without ASE system
2
3
4
5

Initiating Actions

1 Depress radio switch
2
3.
4
5

Ending Conditions

1. Call made to LSO
2
3
4
5

Ending Actions

1 Release radio switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Radio switch on cyclic	Depress
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 3 Troubleshoot Failures during Approach
Second Level: 1 3 1 Troubleshoot ASE Failure
Third Level: 1 3 1 1 Troubleshoot ASE Failure

Source Goal: 1 3 1 1 36 Switch hover indicator to "A" mode
Description: Pilot will switch his hover indicator to A mode so he can observe any indications if there are any

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:
Pyschomotor: 1 1 Automatised, highly learned
Memory:

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 2
Audition: 0
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Hover indicator mode Global
2
3

Influenced Internal Variables

1 Perception of hover indicator status/position
2
3

Output Interface(s)

1 Hover indicator
2
3
4
5

Input Interface(s)

1 Hover indicator
2
3
4
5

Goal Criticality

Safety: 2 **Mission:** 2 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1
Goal Criticality Rating: (GCR) 3
Limits. 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 3 1 1 36 Switch hover indicator to "A" mode

Description: Pilot will switch his hover indicator to A mode so he can observe any indications if there are any

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Inbound for recovery
2
3
4
5

Initiating Actions

1 Turn knob on hover indicator
2
3
4
5

Ending Conditions

1 Hover indicator switched
2
3
4
5

Ending Actions

1 Release hover indicator knob
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Knob on hover indicator	Turn to correct mode
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 1 Complete Pre-Landing Checks

Source Goal: 1 1 1 1 8 Determine most likely flying course, wind speed, and direction

Description: Pilot will use his experience to best guess what the most likely flying course, wind speed, and direction the ship will be travelling for recovery Pilot will use weather forecasts, Pireps, reports from ship, and tactical situation to estimate likely parameters

Completion Time: (seconds) 10
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 0 None

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 7
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of likely flying course
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 3 **Efficiency:** 3 **Reliability:** 1 **Cost.** 1
Goal Criticality Rating: (GCR) 3

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 3

Criticality Rationale:

This task has slight potential to adversely affect Safety, Mission Effectiveness/Completion, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 1 8 Determine most likely flying course, wind speed, and direction

Description: Pilot will use his experience to best guess what the most likely flying course, wind speed, and direction the ship will be travelling for recovery
Pilot will use weather forecasts, Pireps, reports from ship, and tactical situation to estimate likely parameters

---

Knowledge Requirements

Declarative

1 Shops
2 Helicopter operating procedures
3
4
5

Situational

1 Past experience used to better guage likely
2 parameters
3
4
5

Initiating Conditions

1 Intention to return to ship
2
3
4
5

Initiating Actions

1 Pilot will guage likely parameters based on available
2 information and experience
3
4
5

Ending Conditions

1 Assessment made about likely numbers
2.
3.
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 15 Request TACCO to transmit intentions to close to ship

Description: Once Helo has received permission to close the ship and/or received clearance for Delta Hover Astern or Signal Charlie, he will request Tacco to transmit to the ship the intentions to close

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cogntive: 2
Psychomotor: 2

Influenced External Variables

1 Status of request to transmit intentions Global
2
3

Influenced Internal Variables

1 Perception of request to transmit intention stat
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 15 Request TACCO to transmit intentions to close to ship

Description: Once Helo has received permission to close the ship and/or received clearance for Delta Hover Astern or Signal Charlie, he will request Tacco to transmit to the ship the intentions to close

---

Knowledge Requirements

Declarative

1 Radio system operations
2 Voice procedures
3
4
5

Situational

1 Knowing where ship is located compared to helo
2 Understanding what phase of the mission it is
3
4
5

Initiating Conditions

1 Permission received from ship to close
2
3
4
5

Initiating Actions

1 Actuate ICS switch
2
3
4
5

Ending Conditions

1 Tacco has called ship to inform intention to close ship
2
3
4
5

Ending Actions

1 Ship informed of intention to close
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	ICS Switch on cyclic	Actuate and hold
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 18 Change radio to L/L freq
Description: After receiving directions from ship to change frequency to land/launch, the non flying pilot will switch radio frequencies as required

Completion Time: (seconds) 5
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 2 Passive (pre attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 2
Audition: 2
Cogntive: 5
Psychomotor: 4

Influenced External Variables

1 Radio frequency Global
2
3

Influenced Internal Variables

1 Perception of radio frequency
2
3

Output Interface(s)

1 Radio control panel
2
3
4
5

Input Interface(s)

1 Radio control panel
2 Radio(s)
3
4
5

Goal Criticality

Safety: 4 **Mission:** 3 **Efficiency:** 8 **Reliability:** 2 **Cost:** 1
Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 18 Change radio to L/L freq

Description: After receiving directions from ship to change frequency to land/launch, the non flying pilot will switch radio frequencies as required

Knowledge Requirements

Declarative

1 Knowledge of what L/L frequency is
2 Knowledge of UHF radio operating procedures
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Instructions to switch to L/L received
2
3
4
5

Initiating Actions

1 NFP makes required changes on radio panel
2
3
4
5.

Ending Conditions

1 Frequency switch made
2
3
4.
5

Ending Actions

1. NFP finishes making changes and informs crew
2 that switch has been made
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	UHF radio panel on center console	NFP will reach down and turn knobs to appropriate frequency
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 1 Day Approach
Second Level: 1 1 1 Prepare Helo for Approach and Landing
Third Level: 1 1 1 2 Communicate with Ship

Source Goal: 1 1 1 2 19 Report change to L/L freq
Description: After non flying pilot makes change to L/L freq he will inform pilot and crew of change over ICS

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Status of frequency change report Global
2
3

Influenced Internal Variables

1 Perception of frequency change report status
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 2 **Mission:** 1 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 2

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 2

Criticality Rationale:

This task has slight potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 1 1 2 19 Report change to L/L freq

Description: After non flying pilot makes change to L/L freq he will inform pilot and crew of change over ICS

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowledge that change has been made successfully
2
3
4
5

Initiating Conditions

1 Switch made on radio to L/L freq
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Crew informed of frequency switch
2
3
4
5

Ending Actions

1
2.
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	ICS Switch on radio panel	NFP will reach down and make ICS switch to talk
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 3 Connect Helo to Hauldown
Third Level: 2 2 3 1 Connect Helo to Hauldown

Source Goal: 2 2 3 1 15 Flash landing lights

Description: If the helo suffers an engine failure while the deck crew are under the helo connecting the messenger to the hauldown cable the pilot is supposed to flash the landing lights to signal them to get out of the way The helo will not be able to maintain the hover and will be forced down

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Influenced External Variables

1 Landing light status (on/off) Global
2
3

Output Interface(s)

1 Landing lights switch
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of landing light status (on/off)
2
3

Input Interface(s)

1 Landing light switch
2 External scene
3
4
5

VACP Ratings

Vision: 1
Audition: 0
Cogntive: 2
Psychomotor: 2

Goal Criticality

Safety: 8 **Mission:** 3 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 1 15 Flash landing lights

Description: If the helo suffers an engine failure while the deck crew are under the helo connecting the messenger to the hauldown cable the pilot is supposed to flash the landing lights to signal them to get out of the way The helo will not be able to maintain the hover and will be forced down

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowing that there has been an engine failure
2 and the helo will be forced to land immediately
3 and there are deck crew under the helo
4
5.

Initiating Conditions

1 Engine failure
2
3
4
5

Initiating Actions

1 Cycle landing lights on collective several times
2
3
4.
5

Ending Conditions

1 Light flashed
2
3
4
5.

Ending Actions

1 Stop cycling landing lights
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Light switch on collective	Cycle landing light switch on and off several times to signal deck crew
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Haukdown Landing
Second Level: 2 2 5 Land Helo
Third Level: 2 2 5 3 Land Helo

Source Goal: 2 2 5 3 12 Observe hand signals from LSO to lower tail probe

Description: After receiving radio call from LSO to lower tail probe, the LSO will also indicate with a thumbs down hand gesture to signal tail probe to be lowered

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 5
Audition: 0
Cognitive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of signal to lower tail probe
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 1 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 2

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 2

Criticality Rationale:

This task has slight potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 5 3 12 Observe hand signals from LSO to lower tail probe

Description: After receiving radio call from LSO to lower tail probe, the LSO will also indicate with a thumbs down hand gesture to signal tail probe to be lowered

Knowledge Requirements

Declarative

1 Flight deck procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Order given by LSO to lower tail probe
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Signal received from LSO
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	LSO	Sight LSO giving hand signal
2			
3.			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 5 Land Helo
Third Level: 2 2 5 3 Land Helo

Source Goal: 2 2 5 3 13 Observe "thumbs up" signal from LSO indicating tail probe is dow

Description: After non flying pilot has lowered tail probe and LSO has confirmed over the radio that tail probe is down, he will also confirm tail probe is down by making a hand signal for the pilot to see

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 5
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of tail probe position indication
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 1 **Efficiency:** 1 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 2

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 2

Criticality Rationale:

This task has slight potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 5 3 13 Observe "thumbs up" signal from LSO indicating tail probe is dow

Description: After non flying pilot has lowered tail probe and LSO has confirmed over the radio that tail probe is down, he will also confirm tail probe is down by making a hand signal for the pilot to see

Knowledge Requirements

Declarative

1 SHOPS and flight deck procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Tail probe has been lowered
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Hand signal seen
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	LSO	Sights LSO hand signal that tail probe is down
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 1 Day Freedeck Landing
Second Level: 2 1 2 Position Helo for Landing
Third Level: 2 1 2 5 Monitor Position of Helo for Landing

Source Goal: 2 1 2 5 1 Watch aircraft position for landing

Description: NFP observes helicopters position to ensure that it is in the appropriate position over the flight deck If it move out of position he will provide conning instructions or advisory to the pilot over the intercom

Completion Time: (seconds) 30

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition. 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of relative aircraft position
2
3

Input Interface(s)

1 External scene
2
3
4
5

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 0

Goal Criticality

Safety: 7 **Mission:** 2 **Efficiency:** 4 **Reliability:** 2 **Cost:** 7 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 1 2 5 1 Watch aircraft position for landing

Description: NFP observes helicopters position to ensure that it is in the appropriate position over the flight deck If it move out of position he will provide conning instructions or advisory to the pilot over the intercom

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Understanding of how the ship and helo are
2 moving in relation to each other
3
4
5

Initiating Conditions

1 Helo over flight deck
2
3
4
5

Initiating Actions

1 NFP will look out front and side windows to help pilot
2 gauge position and height over flight deck
3
4.
5

Ending Conditions

1 Helo on deck
2
3.
4
5

Ending Actions

1 Cease observing
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Ship and flight deck	Looking around
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing
First Level: 2 2 Day Hauldown Landing
Second Level: 2 2 2 Position Helo for Hookup
Third Level: 2 2 2 5 Supervise Preparation of Helo for Landing

Source Goal: 2 2 2 5 1 Observe and listen to crew actions for preparation of landing

Description: Pilot will observe crew to ensure that all required actions for landing are completed This is to enhance helicopter safety

Completion Time: (seconds) 60

Feedback to Higher Level Goal: F

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 2 Automatised, highly learned perception
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 1 Automatised
Kinesthetic: 0 None

VACP Ratings

Vision: 1
Audition: 2
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of crew behaviour
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Cockpit scene
2 ICS
3
4
5

Goal Criticality

Safety: 5 **Mission:** 3 **Efficiency:** 4 **Reliability:** 2 **Cost:** 6 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 2 5 1 Observe and listen to crew actions for preparation of landing

Description: Pilot will observe crew to ensure that all required actions for landing are completed This is to enhance helicopter safety

---

Knowledge Requirements

Declarative

1. Helicopter operating procedures
2
3
4
5

Situational

1 Understanding of the level of experience of
2 individual crew members
3
4.
5

Initiating Conditions

1 Preparations for landing underway
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 Preparations for landing complete
2
3
4
5.

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1.			
2			
3.			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 2 Landing

First Level: 2 2 Day Hauldown Landing

Second Level: 2 2 3 Connect Helo to Hauldown

Third Level: 2 2 3 5 Monitor Hook-up

Source Goal: 2 2 3 5 1 Monitor hook-up sequence

Description: NFP will monitor hookup sequence as a backup to the pilot and rest of crew He will observe all aspects to ensure safety Particular attention must be paid to internal helicopter instruments and displays as the pilot will be almost exclusively looking outside to maintain reference to ship

Completion Time: (seconds) 60

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice:

Pyschomotor:

Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition

Audition: 0 None

Memory: 2 3 Spatial decoding

Kinesthetic:

Influenced Internal Variables

1 Perception of hook-up sequence status
2
3

Input Interface(s)

1 External scene
2
3
4
5

VACP Ratings

Vision: 6

Audition: 0

Cognitive: 7

Psychomotor: 0

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 5

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 2 2 3 5 1 Monitor hook-up sequence

Description: NFP will monitor hookup sequence as a backup to the pilot and rest of crew He will observe all aspects to ensure safety Particular attention must be paid to internal helicopter instruments and displays as the pilot will be almost exclusively looking outside to maintain reference to ship

---

Knowledge Requirements

Declarative

1 Helicopter Operating Instructions
2
3
4
5

Situational

1 Understanding what the indicators should say
2 based on the situation
3
4
5

Initiating Conditions

1 Beginning of hookup sequence
2
3
4
5

Initiating Actions

1 Start observing all hookup actions
2
3
4
5

Ending Conditions

1 End of hookup sequence
2.
3
4
5

Ending Actions

1 Stop watching all hookup sequences
2
3
4
5.

Safework Data

	Body Part	Target	Action
1	Eyes	Helicopter instruments	Observe all indicators for proper function
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 1 Conduct Pre Takeoff Checks

Source Goal: 3 1 1 1 2 Receive call to complete pre take off checklist
Description: NFP will receive call from Pilot requesting checks to be completed

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cognitive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of pre take off status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 ICS
2
3
4
5

Goal Criticality

Safety: 1 **Mission:** 2 **Efficiency:** 7 **Reliability:** 2 **Cost:** 1
Goal Criticality Rating: (GCR) 7

Limits: 0 **Improve:** 0
Adjusted Goal Criticality Rating: (AGCR) 7

Criticality Rationale:

This task has high potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 1 2 Receive call to complete pre take off checklist

Description: NFP will receive call from Pilot requesting checks to be completed

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot calls NFP to request checklist
2
3
4
5

Initiating Actions

1
2
3
4
5

Ending Conditions

1 NFP receives call from Pilot
2
3
4
5

Ending Actions

1
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 2 Launch Helo
Third Level: 3 1 2 1 Launch Helo

Source Goal: 3 1 2 1 1 Receive call from LSO to launch
Description: LSO calls the helicopter with a clearance such as Signal Charlie Hauldown or other information such as numbers for recovery

Completion Time: (seconds) 3
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of launch clearance
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Radio(s)
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 4 **Efficiency:** 8 **Reliability:** 1 **Cost:** 2 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 2.1 1 Receive call from LSO to launch

Description: LSO calls the helicopter with a clearance such as Signal Charlie Hauldown or other information such as numbers for recovery

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 LSO has information to pass the helo
2
3.
4
5

Initiating Actions

1 None
2
3
4
5

Ending Conditions

1 Information has been passed
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 2 Launch Helo
Third Level: 3 1 2 1 Launch Helo

Source Goal: 3 1 2 1 11 Take off

Description: On the call of the LSO after the ASE is engaged and the tail probed raised, the pilot will with a smooth but quick motion pull up the collective and lift the helicopter into the air Normally, best practice is to immediately climb to the High Hover position to get safely away from the pitching deck

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 4
Psychomotor: 5

Influenced External Variables

1 Aircraft position Global
2 Position of flight controls
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight controls position
3

Output Interface(s)

1 Cyclic
2 Tail rudder pedals
3 Collective
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 8 **Mission:** 7 **Efficiency:** 5 **Reliability:** 1 **Cost:** 8

Goal Criticality Rating: (GCR) 10

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 2 1 11 Take off

Description: On the call of the LSO after the ASE is engaged and the tail probed raised, the pilot will with a smooth but quick motion pull up the collective and lift the helicopter into the air Normally, best practice is to immediately climb to the High Hover position to get safely away from the pitching deck

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 LSO has called cleared take off
2 ASE is engaged
3 Tail probe raised
4 Trap open
5

Initiating Actions

1 Pilot raises collective to take off
2
3
4
5

Ending Conditions

1 Helo is in High Hover
2
3
4
5

Ending Actions

1 Maintain helo in position
2
3
4.
5

Safework Data

	Body Part	Target	Action
1	Left Arm	Collective	Raise collective in smooth but quick motion
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 2 Launch Helo
Third Level: 3 1 2 2 Check Helo & Area

Source Goal: 3 1 2 2 1 Check area around helo

Description: When helo reaches high hover, pilot and NFP will check area around helo and ship to ensure safety and clearance prior to departing

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice:
Pyschomotor:
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 7
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of aircraft clearance
2 Perception of aircraft safety
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 External scene
2
3
4
5

Goal Criticality

Safety: 7 **Mission:** 3 **Efficiency.** 2 **Reliability:** 1 **Cost:** 7 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 2 2 1 Check area around helo

Description: When helo reaches high hover, pilot and NFP will check area around helo and ship to ensure safety and clearance prior to departing

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1 Knowledge of what to expect around ship and area
2 at time
3
4
5

Initiating Conditions

1 Helo reaches high hover
2
3
4
5

Initiating Actions

1 Pilot and NFP look around
2
3
4
5

Ending Conditions

1 Area is checked
2
3
4
5

Ending Actions

1 Pilot and NFP stop looking around
2.
3
4
5.

Safework Data

	Body Part	Target	Action
1	Eyes	Area around ship	Look around
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure
First Level: 4 1 Day Departure
Second Level: 4 1 1 Move Helo Away from Ship
Third Level: 4 1 1 1 Fly Helo to Abeam Ship

Source Goal: 4 1 1 1 1 Fly helo abeam ship

Description: When helo is in high hover and ready to depart, pilot will fly helo laterally over ship to reach a spot abeam the flight deck where he will stop the motion of helo momentarily

Completion Time: (seconds) 5

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cognitive: 4
Psychomotor: 5

Influenced External Variables

1 Aircraft position Global
2 Position of flight controls Global
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight control position
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 8 **Mission:** 1 **Efficiency:** 1 **Reliability:** 1 **Cost:** 7 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 1 1 1 1 Fly helo abeam ship

Description: When helo is in high hover and ready to depart, pilot will fly helo laterally over ship to reach a spot abeam the flight deck where he will stop the motion of helo momentarily

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo in high hover and ready to move
2
3
4
5

Initiating Actions

1 Move controls to fly sideways
2
3
4
5.

Ending Conditions

1 Helo in position abeam ship
2.
3
4
5

Ending Actions

1 Stop helicopter in position
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Manipulate to maintain correct altitude.
2	Right Hand	Cyclic	Manipulate to ease the helicopter left or right and into position
3	Both Feet	Tail Rotor Pedals	Manipulate to maintain heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure

First Level: 4 1 Day Departure

Second Level: 4 1 1 Move Helo Away from Ship

Third Level: 4 1 1 2 Raise Landing Gear

Source Goal: 4 1 1 2 1 Raise landing gear

Description: As the helo move across the flight deck and is over the water the NFP will raise the landing gear He will check the instrument panel to ensure the landing gear indicators indicate up

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 0 None

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 4
Audition: 0
Cognitive: 2
Psychomotor: 4

Influenced External Variables

1 Landing gear position Global
2
3

Influenced Internal Variables

1 Perception of landing gear position
2
3

Output Interface(s)

1 Landing gear handle
2
3
4
5

Input Interface(s)

1 Landing gear handle
2
3
4
5

Goal Criticality

Safety: 5 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 1 **Goal Criticality Rating: (GCR)** 5

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 1 1 2 1 Raise landing gear

Description: As the helo move across the flight deck and is over the water the NFP will raise the landing gear He will check the instrument panel to ensure the landing gear indicators indicate up

Knowledge Requirements

Declarative

1 *Helicopter operating procedures*
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo moving over the flight deck
2
3
4
5

Initiating Actions

1 Raise landing gear handle
2
3
4
5

Ending Conditions

1 Landing gear up
2
3
4
5

Ending Actions

1 Release gear handle
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Right Hand	Landing gear handle	Raise landing gear handle
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure
First Level: 4 1 Day Departure
Second Level: 4 1 2 Transition Forward
Third Level: 4 1 2 1 Transition Forward

Source Goal: 4 1 2 1 1 Fly helicopter forward and up
Description: After helo is stabilized and gear is up pilot will fly helicopter forward and up, away from ship

Completion Time: (seconds) 20
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 0
Audition: 0
Cognitive: 0
Psychomotor: 0

Influenced External Variables

1 Aircraft position Global
2 Position of flight controls Global
3

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of flight controls position
3

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 7 **Mission:** 2 **Efficiency:** 2 **Reliability:** 1 **Cost:** 8 **Goal Criticality Rating: (GCR)** 8

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 8

Criticality Rationale:

This task has high potential to adversely affect Safety, Cost if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 1 2 1 1 Fly helicopter forward and up

Description: After helo is stabilized and gear is up pilot will fly helicopter forward and up, away from ship

---

Knowledge Requirements

Declarative

1 Helicopter operating procedures
2 *Weather conditions of the day*
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Helo in position abeam ship with gear up
2
3
4
5

Initiating Actions

1 Move flight controls to fly forward and up
2
3
4
5

Ending Conditions

1 Helo has completed transition to forward flight
2
3
4
5

Ending Actions

1 Cease transitioning and maintain desired flight regime
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Hand	Collective	Manipulate to maintain correct altitude
2	Right Hand	Cyclic	Manipulate to fly helicopter forward
3	Both Feet	Tail rotor pedals	Manipulate to maintain heading and prevent yaw
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 1 Approach
First Level: 1 2 Night Approach
Second Level: 1 2 1 Prepare Helo for Approach and Landing
Third Level: 1 2 1 2 Communicate with Ship

Source Goal: 1 2 1 2 17 Receive request to change to L/L freq

Description: NFP will receive a request from the Pilot over the ICS requesting that some action be taken such as completing check lists of other actions such as changing radio frequencies or lowering the landing gear

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 0 None
Audition: 5 Verbal decoding, speech recognition
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of desired radio frequency
2
3

Input Interface(s)

1 ICS
2
3
4
5

VACP Ratings

Vision: 0
Audition: 4
Cogntive: 5
Psychomotor: 0

Goal Criticality

Safety: 3 **Mission:** 2 **Efficiency:** 9 **Reliability:** 2 **Cost:** 1

Goal Criticality Rating: (GCR) 10

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 10

Criticality Rationale:

This task has high potential to adversely affect Efficiency if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 1 2 1 2 17 Receive request to change to L/L freq

Description: NFP will receive a request from the Pilot over the ICS requesting that some action be taken such as completing check lists of other actions such as changing radio frequencies or lowering the landing gear

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4.
5

Initiating Conditions

1 Pilot has some need of the NFP
2
3
4
5

Initiating Actions

1 None
2
3.
4
5

Ending Conditions

1. NFP has received communication from Pilot
2
3
4
5

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1			
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure
First Level: 4 2 Night Departure
Second Level. 4 2 2 Transition Forward
Third Level: 4 2 2 1 Transition Forward

Source Goal: 4 2 2 1 1 Begin altitude over airspeed climb
Description: After establishing the helo in a position slightly higher and further aft than normal during the day, the pilot will commence an altitude over airspeed climb while maintaining visual contact with the ship

Completion Time: (seconds) 20
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 2 Spatial encoding
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 5 Recall
Kinesthetic: 1 2 Spatial encoding

VACP Ratings

Vision: 6
Audition: 0
Cogntive: 7
Psychomotor: 5

Influenced External Variables

1	Aircraft position	Global
2	Climb rate	Global
3	Position of flight controls	Global

Influenced Internal Variables

1 Perception of aircraft position
2 Perception of climb rate
3 Perception of flight control position

Output Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4
5

Input Interface(s)

1 Cyclic
2 Collective
3 Tail rudder pedals
4 External scene
5 Flight instruments

Goal Criticality

Safety: 8 **Mission:** 6 **Efficiency:** 5 **Reliability:** 1 **Cost:** 7 **Goal Criticality Rating: (GCR)** 10

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 10

Criticality Rationale:

This task has high potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 2 2 1 1 Begin altitude over airspeed climb

Description: After establishing the helo in a position slightly higher and further aft than normal during the day, the pilot will commence an altitude over airspeed climb while maintaining visual contact with the ship

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1.
2
3
4
5

Initiating Conditions

1 In hover abeam and slightly aft of ship
2
3
4
5

Initiating Actions

1 Raise collective and move cyclic forward
2
3
4
5

Ending Conditions

1 Helo levels off at altitude, usually 150 or 200 feet
2
3
4
5

Ending Actions

1 Level helo and maintain appropriate course
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Left Arm	Collective	Raise collective to initiate climb
2	Right Arm	Cyclic	Move forward to transition helo forward
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure
First Level: 4 2 Night Departure
Second Level: 4 2 2 Transition Forward
Third Level: 4 2 2 1 Transition Forward

Source Goal: 4 2 2 1 2 Call instruments and Safe Single Engine Speed

Description: While helo is climbing away using altitude over airspeed, the NFP will call altitude from the radar altimeter and airspeed Call frequency every second

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 1 Speech production
Pyschomotor: 1 1 Automatised, highly learned
Memory:

Input/Sensation

Vision: 0 None
Audition: 2 Passive (pre-attentive) monitoring of auditory signals
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

VACP Ratings

Vision: 0
Audition: 2
Cognitive: 2
Psychomotor: 2

Influenced External Variables

1 Status of Safe Single Engine Speed message Global
2
3

Influenced Internal Variables

1 Perception of Safe Single Engine Speed messa
2
3

Output Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on panel
3
4
5

Goal Criticality

Safety: 5 **Mission:** 1 **Efficiency:** 3 **Reliability:** 1 **Cost:** 1

Goal Criticality Rating: (GCR) 5

Limits: 0 **Improve:** 0

Adjusted Goal Criticality Rating: (AGCR) 5

Criticality Rationale:

This task has moderate potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 2 2 1 2 Call instruments and Safe Single Engine Speed

Description: While helo is climbing away using altitude over airspeed, the NFP will call altitude from the radar altimeter and airspeed Call frequency every second

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3.
4
5.

Initiating Conditions

1 Pilot commences climb away from ship
2
3
4
5.

Initiating Actions

1 Depress ICS
2 Call altitude and airspeed
3
4
5

Ending Conditions

1 Pilot calls to cease reporting
2
3
4
5

Ending Actions

1 Release ICS switch
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Instrument panel	Calling out altitude and airspeed instruments
2	Left Hand	Side com panel ICS switch	Depress to talk
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 4 Departure
First Level: 4 2 Night Departure
Second Level: 4 2 2 Transition Forward
Third Level: 4 2 2 1 Transition Forward

Source Goal: 4 2 2 1 3 Call "Going to instruments"

Description: As the pilot loses visual reference to ship, he will move his sight picture inside and transition to instrument only flight The NFP will continue calling out references until the pilot is comfortable with the situation

Completion Time: (seconds) 3

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice:	1	Speech production
Pyschomotor:	1 1	Automatised, highly learned
Memory:	0	None

Input/Sensation

Vision:	0	None
Audition:	2	Passive (pre-attentive) monitoring of auditory signals
Memory:	2 2	Verbal decoding
Kinesthetic:	1 1	Automatised, highly learned perception

VACP Ratings

Vision:	0
Audition:	2
Cogntive:	2
Psychomotor:	2

Influenced External Variables

1 Status of "Going to instruments" message Global
2
3

Influenced Internal Variables

1 Perception of "Going to instruments" message
2
3

Output Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Input Interface(s)

1 ICS
2 ICS switch on cyclic
3
4
5

Goal Criticality

Safety: 2 **Mission:** 1 **Efficiency:** 2 **Reliability:** 2 **Cost:** 1

Goal Criticality Rating: (GCR) 2

Limits: 0 **Improve:** 0

Adjusted Goal Criticalty Rating: (AGCR) 2

Criticality Rationale:

This task has slight potential to adversely affect Safety if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 4 2 2 1 3 Call "Going to instruments"

Description: As the pilot loses visual reference to ship, he will move his sight picture inside and transition to instrument only flight The NFP will continue calling out references until the pilot is comfortable with the situation

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Losing visual reference to the ship
2
3
4
5

Initiating Actions

1 Move sight picture to instruments
2
3
4
5

Ending Conditions

1 Sight picture on instruments
2
3
4
5

Ending Actions

1 Eyes on instruments
2
3
4
5

Safework Data

	Body Part	**Target**	**Action**
1	Right Hand	ICS switch on cyclic	Depress
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 5 Check rotor brake

Description: NFP will look up to the overhead panel and check that the rotor brake is in the detent with no pressure indicating on the associated gauge He will also confirm there is no rotor brake light illuminated on the caution panel He will verbalize this check and all other checks

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 2
Audition: 0
Cogntive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of rotor brake status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Overhead panel
2 Caution panel
3
4
5

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 5 Check rotor brake

Description: NFP will look up to the overhead panel and check that the rotor brake is in the detent with no pressure indicating on the associated gauge He will also confirm there is no rotor brake light illuminated on the caution panel He will verbalize this check and all other checks

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Pilot has requested panel check for take off
2
3
4
5

Initiating Actions

1 Look at rotor brake and indicator
2 Look at the caution panel
3
4
5

Ending Conditions

1 Rotor break checked
2
3
4
5

Ending Actions

1 Look back ahead
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Rotor brake and gauge	Look to check rotor brake in detent and gauge shows no pressure
2	Eyes	Warning panel	Check that rotor brake light is not illuminated
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 6 Check tail wheel locked
Description: NFP will look at the tail wheel handle and ensure that it is in the fully up and locked position indicating that it is locked

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☐

Output/Behaviour

Voice: 0 None
Pyschomotor: 1 1 Automatised, highly learned
Memory: 1 Memorization

Influenced External Variables

1 Position of tail wheel handle Global
2
3

Output Interface(s)

1 Tail wheel handle
2
3
4
5

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 2 Verbal decoding
Kinesthetic: 1 1 Automatised, highly learned perception

Influenced Internal Variables

1 Perception of tail wheel handle position
2
3

Input Interface(s)

1 Tail wheel handle
2
3
4
5

VACP Ratings

Vision: 4
Audition: 0
Cogntive: 2
Psychomotor: 1

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 6 Check tail wheel locked

Description: NFP will look at the tail wheel handle and ensure that it is in the fully up and locked position indicating that it is locked

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Rotor break was checked
2
3
4
5

Initiating Actions

1 Look at the tail wheel handle
2 Manually confirm it is fully up and locked
3
4
5

Ending Conditions

1 Tail wheel handle checked
2
3
4
5

Ending Actions

1 Look ahead
2 Release tail wheel handle
3
4
5.

Safework Data

	Body Part	Target	Action
1	Eyes	Tail wheel handle	Looks to see if it is up and locked
2	Right Hand	Tail wheel handle	Pulls up on handle to ensure it is locked
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 7 Check brakes are set

Description: After the tail wheel is checked the NFP will check that the brakes are set by examining the handle and insuring it is in the fully up and locked position He will also check the advisory panel looking for the light indicating brakes set

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 2 Spatial encoding, visual pattern recognition
Audition: 0 None
Memory: 2 3 Spatial decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 4
Audition: 0
Cognitive: 2
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of brakes status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Brake handle
2 Advisory panel
3
4
5

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 7 Check brakes are set

Description: After the tail wheel is checked the NFP will check that the brakes are set by examining the handle and insuring it is in the fully up and locked position He will also check the advisory panel looking for the light indicating brakes set

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4.
5

Initiating Conditions

1 Tail wheel was checked
2
3
4.
5

Initiating Actions

1 Manually examine handle is up and locked
2 Visually check advisory panel for lights
3
4
5

Ending Conditions

1 Tail wheel checked locked
2
3
4
5

Ending Actions

1 Release handle
2 look ahead
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Brake handle	Look at handle to see if it is up and locked
2	Eyes	Advisory panel	Check there is no Brakes light illuminated on the panel
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 8 Check pylon is locked
Description: NFP will check the advisory panel looking for lights indicating whether the pylon is unlocked

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4.
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of pylon status
2
3

Input Interface(s)

1 Advisory panel
2
3
4
5

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 2
Psychomotor: 0

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 8 Check pylon is locked

Description: NFP will check the advisory panel looking for lights indicating whether the pylon is unlocked

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Brakes have been checked
2
3
4.
5

Initiating Actions

1 Look at advisory panel
2
3.
4
5

Ending Conditions

1 Panel has been checked for pylon lights
2
3
4
5

Ending Actions

1 None
2.
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Advisory panel	Look for Pylon light Should not be illuminated
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 9 Check servos are operating

Description: NFP will start at the bottom of the front instrument panel looking at the servos to ensure proper pressure He will verbalize that servos check

Completion Time: (seconds) 2

Feedback to Higher Level Goal: ☑

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 2 Verbal decoding
Kinesthetic: 0 None

VACP Ratings

Vision: 2
Audition: 0
Cogntive: 5
Psychomotor: 0

Influenced External Variables

1
2
3

Influenced Internal Variables

1 Perception of servo status
2
3

Output Interface(s)

1
2
3
4
5

Input Interface(s)

1 Centre instrument panel
2
3
4
5

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 2 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 9 Check servos are operating

Description: NFP will start at the bottom of the front instrument panel looking at the servos to ensure proper pressure He will verbalize that servos check

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1.
2
3
4
5

Initiating Conditions

1 Pylon was checked
2
3
4
5

Initiating Actions

1 Look at main instrument panel servo gauges
2
3
4
5.

Ending Conditions

1 Servos checked
2
3
4
5.

Ending Actions

1 None
2
3
4
5

Safework Data

	Body Part	Target	Action
1	Eyes	Centre instrument panel	Look for correct indications of pressure
2			
3			
4			

ANNEX E - DETAILED GOAL ANALYSIS: Part 1

Top Level: 3 Takeoff
First Level: 3 1 Takeoff
Second Level: 3 1 1 Prepare to Launch Helo
Third Level: 3 1 1 2 Complete Panel Checklist

Source Goal: 3 1 1 2 10 Check engine instruments are correct
Description: NFP will check instrument panel checking for proper indications from the engine instruments

Completion Time: (seconds) 2
Feedback to Higher Level Goal: ☒

Output/Behaviour

Voice: 0 None
Pyschomotor: 0 None
Memory: 1 Memorization

Influenced External Variables

1
2
3

Output Interface(s)

1
2
3
4
5

Input/Sensation

Vision: 1 1 Verbal encoding
Audition: 0 None
Memory: 2 1 Automatised
Kinesthetic: 0 None

Influenced Internal Variables

1 Perception of engine instrument status
2
3

Input Interface(s)

1 Flight instruments
2
3
4
5

VACP Ratings

Vision: 3
Audition: 0
Cogntive: 4
Psychomotor: 0

Goal Criticality

Safety: 3 **Mission:** 8 **Efficiency:** 4 **Reliability:** 2 **Cost:** 1 **Goal Criticality Rating: (GCR)** 7

Limits: 0 **Improve:** 0 **Adjusted Goal Criticality Rating: (AGCR)** 7

Criticality Rationale:

This task has high potential to adversely affect Mission Effectiveness/Completion if improperly performed The demands of this task do not approach human performance limits Further analysis of this task is unlikely to result in improvement

ANNEX E - DETAILED GOAL ANALYSIS: Part 2

Source Goal: 3 1 1 2 10 Check engine instruments are correct

Description: NFP will check instrument panel checking for proper indications from the engine instruments

---

Knowledge Requirements

Declarative

1
2
3
4
5

Situational

1
2
3
4
5

Initiating Conditions

1 Servos have been checked
2
3
4
5

Initiating Actions

1 Look at engine instrument gauges
2
3
4
5

Ending Conditions

1 Engine instruments checked
2
3
4
5

Ending Actions

1 None
2
3
4.
5.

Safework Data

	Body Part	Target	Action
1	Eyes	Engine instruments	Look at instruments to confirm correct indications
2			
3			
4			

ANNEX F

CRITICAL GOAL ANALYSIS

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 1 1 1 7 Maintain desired condition of flight

Description: Pilot will operate controls so as to maintain the helicopter in the desired condtion of flight whether that is straight and level, in a climb, descent, turn, etc

Information Available:

1 Position of aircraft in space
2 Aircraft safety parameters (e g single safe engine speed)
3
4

Evaluation Process:

Compare current aircraft position with desired location or flight path

Decisions:

1 Corrective flight control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: Continuous

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 1 1 3 3 Sight ship

Description: Whichever crew member sights the ship first will inform the others Pilot will generally fly visually to ship at this point

Information Available:

1 Possible ship location
2
3
4

Evaluation Process:

The crew consider the probable ship location and the physical attributes of the observed ship to determine if it is the correct ship

Decisions:

1 Correct ship
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Flying Pilot
2 Non-Flying Pilot
3

Frequency: Once or twice per mission

Accuracy: High

Workspace Required:

Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Communication amongst crew to confirm sighting

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

N/A

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 1 1 4 9 Check throttles set to full

Description: NFP will check that throttles are set to full as last item of panel check list

Information Available: 1 Position of throttles 2 3 4	**Evaluation Process:** Compare current position of throttles with desired state	**Decisions:** 1 Assessment of throttle position 2 3
Movement Required: 1 View throttles 2 3	**Personnel Required:** 1 Non-Flying Pilot 2 3	**Frequency:** 3-4 times per mission **Accuracy:** Medium
Workspace Required: Unencumbered access/view of throttles	**Workspace Available:** As required	**Location and Condition of Workspace:** Cockpit
Tools and Job aids Required: None	**Communications Required:** None	**Operator Interaction Required:** None
Personnel Limits: This task does not approach personnel limits	**Machine Limits:** N/A	

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 1 2 1 1 Commence descent and deceleration

Description: As the helo comes to an appropriate distance from the ship, which depends on the conditions of the day, the pilot will lower the collective and pull back on the cyclic to begin a deceleration and descent

Information Available:

1 Position of aircraft in space (relative to ship)
2 Tactical situation
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

The pilot assess aircraft position relative to the ship and considers the operating conditions of the day

Decisions:

1 Position/time to initiate descent/deceleration
2 Rate for descent/deceleration
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per approach to ship

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

May involve brief warning to crew on ICS

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 2 1 2 17 Receive request to change to L/L freq

Description: NFP will receive a request from the Pilot over the ICS requesting that some action be taken such as completing check lists of other actions such as changing radio frequencies or lowering the landing gear

Information Available:

1 N/A
2
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Flying Pilot
2 Non-Flying Pilot
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal over ICS

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 2 2 1 1 Pass controls to NFP

Description: Pilot tells the NFP over the intercom "You have control" When the NFP responds in the affirmative and takes control, the Pilot will release the controls

Information Available:
1 NFP's readiness to accept control
2
3
4

Evaluation Process:
Pilot will assess NFP's readiness to accept controls

Decisions:
1 To pass control to the NFP
2
3

Movement Required:
1 Releasing flight controls
2
3

Personnel Required:
1 Pilot
2 Non-Flying Pilot
3

Frequency: 4 or 5 times per mission
Accuracy: Medium

Workspace Required:
Free and clear access to flight controls

Workspace Available:
As required

Location and Condition of Workspace:
Cockpit

Tools and Job aids Required:
None

Communications Required:
Verbal communications over intercom between pilot and NFP

Operator Interaction Required:
None

Personnel Limits:
This goal does not approach human performance limits

Machine Limits:
This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 2 2 1 12 Establish hover in delta hover astern position

Description: As the helo approaches the ship, the pilot will continue to descend and decelerate until he comes into position just aft and to the side of the ship on its quarter Which side of the ship depends on the relative wind If it is a red wind the pilot will fly to the port side of the ship Starboard otherwise As the helo nears the ship, the NFP will continue conning and cross checking instruments At this point the NFP may take control of the aircraft

Information Available:

1 Position of ship
2 Numbers for recovery
3 Aircraft safety parameters (e g single safe engine speed)
4 Position of aircraft in space

Evaluation Process:

Compare current aircraft position with desired flight path or location

Decisions:

1 Hover altitude
2 Position relative to the ship for hovering
3 Corrective control inputs (as required)

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: High

Workspace Required:

Unencumbered access to flight controls Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 2 2 1 13 Take control of helo from FP

Description: As the helo nears the ship, the NFP will continue conning and cross checking instruments When the NFP feels his references are good enough he will take control of the helo First he will say "I'm coming on the controls lightly" and place his hands and feet on the controls This is done to accustom the NFP to the control feeling and how the helo is flying prior to assuming full control When fully comfortable he will say "I have control" and take control of helo

Information Available:

1 Position of aircraft in space
2 Aircraft safety parameters (e g safe single engine speed)
3 Relative position of ship and aircraft
4

Evaluation Process:

The NFP assesses his/her mental model of the current tactical situation and the flight regime to determine if he/she has adequate information to take control of the aircraft

Decisions:

1 To accept control of the aircraft
2
3

Movement Required:

1 Manipulation of flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2 Non-Flying Pilot
3

Frequency: 4 or 5 times per mission

Accuracy: Medium

Workspace Required:

Unencumbered access to flight controls Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal over ICS

Operator Interaction Required:

Both pilots must negotiate control of the flight controls (e g pedals, cyclic, collective) to maintain a safe flight regime

Personnel Limits:

This goal does approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 1 Sense control malfunction

Description: While flying aircraft pilot will sense an ASE malfuntion by a perceived loss of stability, particularly in roll and pitch If pilot is flying smoothly and coordinated loss of ASE may not be immediately apparent

Information Available:

1 Position of aircraft in space
2 Aircraft safety parameters (e g safe single engine speed)
3 Aircraft handling characteristics
4

Evaluation Process:

Flying Pilot compares aircraft movement with applied control inputs to determine if the aircraft is handling as expected

Decisions:

1 Corrective flight control inputs (as required)
2 Identification of control malfunction
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: < 1 per mission

Accuracy: High

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 12 Receives briefing on malfunction indications

Description: NFP will examine ASE system and then inform the Pilot and crew of his findings

Information Available:

1 N/A
2
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Flying Pilot
2 Non-Flying Pilot
3

Frequency: < 1 per mission

Accuracy: Medium

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal over ICS

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 3 Call for full power both

Description: Pilot will call for full power both to non flying pilot This is to signal NFP to bring both speed selector levers to full forward postion This is generally the first action a pilot will do when an emergency manifests itself It signals the crew to an unusual situation

Information Available:

1
2
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 Key ICS
2
3

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1-2 per mission

Accuracy: Low

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal via ICS

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 4 Receive call for full power both

Description: Non flying pilot receives call for full power both

Information Available:

1 N/A
2
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Flying Pilot
2 Non-Flying Pilot
3

Frequency: < 1 per mission

Accuracy: Medium

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal over ICS

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 6 Confirm full power both

Description: When throttles are set to full. non flying pilot confirms over ICS to pilot of the fact

Information Available:

1 Throttle position
2
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 Key ICS
2
3

Personnel Required:

1 Non-Flying Pilot
2
3

Frequency: 1-2 per mission

Accuracy: Low

Workspace Required:

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

Communications Required:

Verbal via ICS

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 1 3 1 1 8 Overshoot approach

Description: If the helo is not is a position to affect a landing, the ship is not spotted, the helo is waved off, or any other saftey concerns become apparent, any one in the crew or even externally over the radio may call for an overshoot from an approach The pilot will initiate a climb to 200 feet and turn away from the ship to the predetermined overshoot heading (aprox 30 degs from flying course of ship into wind)

Information Available:

1 Position of aircraft in space
2 Position of ship
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Compare current aircraft position with desired flight path or location, considering safety concerns

Decisions:

1 To overshoot the approach
2 Corrective control inputs (as required)
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1-2 times per mission

Accuracy: Low

Workspace Required:

Unencumbered access to flight controls Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 1 1 1 Look over ship for safety and readiness

Description: Pilot and NFP will visually look over the ship and surrounding area to ensure it is ready for recovery and for safety consideration such as FOD Areas to be observed include the quarterdeck, flightdeck, hanger face, hanger top, and any other conveniently visible areas Ensure flight deck nets are down and secure Check position of trap For hauldown landings, see that the cable is coiled appropriately beside trap At night, check that all lights are illuminated as appropriate and that they are at a comfortable brightness

Information Available:

1 Sight of ship and its condition
2 Clearance from LSO
3
4

Evaluation Process:

Crew will look over deck to ensure ready for a safe recovery within limits If the ship is not ready for landing, the crew may decide to "wave off"

Decisions:

1 To accept landing clearance
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Pilot
2 NFP
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Clear view of ship

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal over ICS

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

N/A

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 1 2 1 Maintain hover relative to ship

Description: Pilot will maintain hover relative to ship's motion to maintain position This includes if the ship is turning The helo should not be cleared to Delta Hover Astern position unless the ship is within 90 degrees of the flying course during the day and not until it is on the flying course at night Hover while over the ship is the same but there are less hover references and the tendency is to follow the ships motion The pilot must strive to observe the horizon to the greatest extent possible to avoid following the ships motion At night there are fewer references which makes hovering more challenging The horizon bars replace the horizon at night

Information Available:

1 Numbers for recovery

2 Relative positions of aircraft and ship

3 Aircraft safety parameters (e g single safe engine speed)

4

Evaluation Process:

Compare current aircraft position with desired flight path or location. The pilot may decide to overshoot the hover

Decisions:

1 Corrective control inputs (as required)

2

3

Movement Required:

1 Manipulate flight controls

2 View external scene

3 View flight instruments

Personnel Required:

1 Flying Pilot

2

3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Unencumbered access to flight controls Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 2 2 1 Fly forward abeam spot

Description: On receiving and acknowledging clearance, Pilot flies helicopter forward to a position lining up with the bum lines on the flight deck and at the High Hover Altitude

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Trafficator light signals
4

Evaluation Process:

Assess movement of ship Compare projected flight path and desired position The pilot may decide to fly forward, maintain his current position, or overshoot the approach

Decisions:

1 Corrective control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2.1.2.3.1 Lower landing gear

Description: As pilot reaches position abeam the ship and is preparing to manoeuvre right, the NFP lowers the landing gear handle

Information Available:

1. Position of helo over ship
2. Status of landing gear
3.
4.

Evaluation Process:

NFP considers flight profile and aircraft position relative to the ship to determine if it is appropriate to lower the landing gear

Decisions:

1. When to lower landing gear
2.
3.

Movement Required:

1. Reach to landing gear handle
2.
3.

Personnel Required:

1. Non Flying Pilot
2.
3.

Frequency: 1 per mission

Accuracy: Low

Workspace Required:

Unencumbered access to landing gear handle

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Flying Pilot may verbally request (over the ICS) that the Non Flying Pilot lower the landing gear

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 2 4 1 Fly helo into High Hover position

Description: Pilot manoeuvres helo into High Hover position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally the pilot puts the appropriate line on the hangar face between his legs The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines At night the position is the same but the pilot will use the horizon bars for reference

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Observe movement of the ship and compare current aircraft position with desired flight path or location

Decisions:

1 Corrective control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

NFP may call position reference to pilot to help with visual references

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 2 4 3 Wait for steady deck

Description: The pilot will maintain and fine tune his position while watching the motion of the ship This will continue until the ship finds a steady period and the pilot is ready for the next phase The NFP will continue his conning advisory as necessary unless the LSO is providing it over the radios or it is unnecessary

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Unobstructed view of external scene Unencumbered access to flight controls

Decisions:

1 Ready to land aircraft
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission
Accuracy: High

Workspace Required:

Corrective control inputs (as required)

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

NFP or LSO may verbally provide conning via the ICS/radio

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 3 1 1 Fly to Low Hover

Description: When the deck is steady and the pilot is ready, he will fly the helo into the low hover This will be done by smoothly lowering the collective and applying pedal to prevent yaw The downwards motion should be smooth and as vertical as possible Lateral and longitudinal drift should be avoided As the helo reaches the low hover, the pilot will raise the collective to arrest descent The low hover position visual reference varies from pilot to pilot but generally the pilot will determine the helo's height by placing the windows in the hangar door against a spot on the windscreen This reference spot changes based on the pilot's size

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Tension on hauldown cable (if required)
4 Aircraft safety parameters (e g single safe engine speed)

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Tools and Job aids Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Evaluation Process:

Compare ship movement with current and desired aircraft position If necessary, the pilot may decide to wave off the landing

Personnel Required:

1 Flying Pilot
2
3

Workspace Available:

As required

Communications Required:

Verbal communication between NFP and Pilot for conning purposes via the ICS

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

Decisions:

1 Corrective control inputs (as required)
2
3

Frequency: 1 per mission

Accuracy: High

Location and Condition of Workspace:

Cockpit

Operator Interaction Required:

None

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 3 3 2 Receive conning from LSO

Description: After calling ready to land, the LSO will provide conning instruction over the radio The commands will be "Ahead, Back, Left, Right, Up, Down, Steady" as required When the Pilot hears the conning instructions he will manoeuvre accordingly

Information Available:

1 Relative positions of aircraft and ship
2 Aircraft safety parameters (e g single safe engine speed)
3
4

Evaluation Process:

N/A

Decisions:

1 None
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Pilot
2 LSO
3

Frequency: 1 per mission

Accuracy: High

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal via radio

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 3 3 3 Receive executive to land helo

Description: When the helo is in a good position and is ready to land the Pilot will receive the executive from the LSO "Land now, down, down, down"

Information Available:

1 Aircraft safety parameters
2 Relative positions of aircraft and ship
3
4

Evaluation Process:

Comparison of aircraft position with direction provided by LSO

Decisions:

1
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Pilot
2 LSO
3

Frequency: 1 per mission

Accuracy: High

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal via radio

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 1 3 3 5 Land helo

Description: On receipt of landing clearance, pilot will lower the collective to place the helo into the RSD (rapid securing device) This should be a smooth but quick motion

Information Available:

1 Executive to land helo
2 Relative positions of aircraft and ship
3
4

Evaluation Process:

Compare current aircraft position with desired flight path or location If necessary, the pilot may decide to wave off the landing

Decisions:

1 Corrective control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: High

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 2 2 4 1 Fly to hook-up position

Description: Pilot manoeuvres helo into hook-up position The position is lined up fore and aft with the bum lines and at a height the allows viewing the horizon over the hangar top Laterally, the pilot will line up with the CIWS The NFP will tell the pilot if he is too far forward or aft as he crosses the deck by checking the bum lines

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Position of deck crew on flight deck
4 Aircraft safety parameters (e g single safe engine speed)

Evaluation Process:

Compare current aircraft position with desired location

Decisions:

1 Corrective flight control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal communication between NFP and Pilot for conning purposes

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 2 3 1 15 Flash landing lights

Description: If the helo suffers an engine failure while the deck crew are under the helo connecting the messenger to the hauldown cable the pilot is supposed to flash the landing lights to signal them to get out of the way The helo will not be able to maintain the hover and will be forced down

Information Available:
1 Nature of equipment failure requiring visual signal
2
3
4

Evaluation Process:
None

Decisions:
1 None
2
3

Movement Required:
1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:
1 Flying Pilot
2
3

Frequency: < 1 per mission
Accuracy: Medium

Workspace Required:
Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:
As required

Location and Condition of Workspace:
Cockpit

Tools and Job aids Required:
None

Communications Required:
None

Operator Interaction Required:
None

Personnel Limits:
This goal does not approach human performance limits

Machine Limits:
This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 2 2 3 4 2 Centre over trap in high hover

Description: When hover tension is applied and the centring force is felt, the Pilot will gently move the helicopter over the RSD and find the normal centre line references for the high hover This means above the hangar so the horizon can be seen, lined up with the bum lines and the lines on the hangar face between his feet

Information Available:

1 Hover tension applied
2 Relative positions of aircraft and ship
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Compare current aircraft position with desired flight path or location, after sensing centring force from hauldown

Decisions:

1 Corrective control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Corrective control inputs (as required)

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on conditions, e g night or inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, this goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 3 1 2 1 1 Receive call from LSO to launch

Description: LSO calls the helicopter with a clearance such as Signal Charlie Hauldown or other information such as numbers for recovery

Information Available:

1 Aircraft safety parameters (e g single safe engine speed)
2 Relative positions of aircraft and ship
3
4

Evaluation Process:

Comparison of aircraft parameters and ship's motion with direction from LSO

Decisions:

1 To launch aircraft
2
3

Movement Required:

1 None
2
3

Personnel Required:

1 Flying Pilot
2 LSO
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Helmet/Headset connected to ICS/Radio(s) Unencumbered access to radio controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

Verbal via radio

Operator Interaction Required:

None

Personnel Limits:

This goal does not approach human performance limits

Machine Limits:

This goal does not approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 3 1 2 1 11 Take off

Description: On the call of the LSO after the ASE is engaged and the tail probed raised, the pilot will with a smooth but quick motion pull up the collective and lift the helicopter into the air Normally, best practice is to immediately climb to the High Hover position to get safely away from the pitching deck

Information Available:

1 Relative position of aircraft and ship
2 Ship movement
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Compare current aircraft position with desired location or flight path Consider implications of ship movement on relative position of aircraft and ship

Decisions:

1 Required flight control inputs (as necessary)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: High

Workspace Required:

Unencumbered access to flight controls Unobstructed view of external scene

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 4 1 1 1 1 Fly helo abeam ship

Description: When helo is in high hover and ready to depart, pilot will fly helo laterally over ship to reach a spot abeam the flight deck where he will stop the motion of helo momentarily

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Aircraft safety parameters (e g single safe engine speed)
4

Evaluation Process:

Compare current aircraft position with desired location or flight path

Decisions:

1 Corrective flight control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1-2 times per mission

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 4 1 2 1 1 Fly helicopter forward and up

Description: After helo is stabilized and gear is up pilot will fly helicopter forward and up, away from ship

Information Available:

1 Relative positions of aircraft and ship
2 Motion of ship relative to aircraft
3 Aircraft safety parameters (e g single safe engine speed)
4

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Tools and Job aids Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Evaluation Process:

Compare current aircraft position with desired location or flight path

Personnel Required:

1 Flying Pilot
2
3

Workspace Available:

As required

Communications Required:

None

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

Decisions:

1 Corrective flight control inputs (as required)
2
3

Frequency: 1 per mission
Accuracy: Medium

Location and Condition of Workspace:

Cockpit

Operator Interaction Required:

None

ANNEX F - CRITICAL GOAL ANALYSIS

Source Goal: 4 2 2 1 1 Begin altitude over airspeed climb

Description: After establishing the helo in a position slightly higher and further aft than normal during the day, the pilot will commence an altitude over airspeed climb while maintaining visual contact with the ship

---

Information Available:

1 Position of aircraft in space
2 Aircraft safety parameters (e g single safe engine speed)
3
4

Evaluation Process:

Compare current aircraft position with desired location or flight path

Decisions:

1 Corrective flight control inputs (as required)
2
3

Movement Required:

1 Manipulate flight controls
2 View external scene
3 View flight instruments

Personnel Required:

1 Flying Pilot
2
3

Frequency: 1 per mission

Accuracy: Medium

Workspace Required:

Unobstructed view of external scene Unencumbered access to flight controls

Workspace Available:

As required

Location and Condition of Workspace:

Cockpit

Tools and Job aids Required:

None

Communications Required:

None

Operator Interaction Required:

None

Personnel Limits:

Depending on the conditions, e g night, inclement weather, this goal may approach human performance limits

Machine Limits:

Depending on conditions and aircraft configuration, the goal may approach machine limits

ANNEX G

OPERATIONAL SEQUENCE DIAGRAMS

ANNEX G – OPERATIONAL SEQUENCE DIAGRAMS

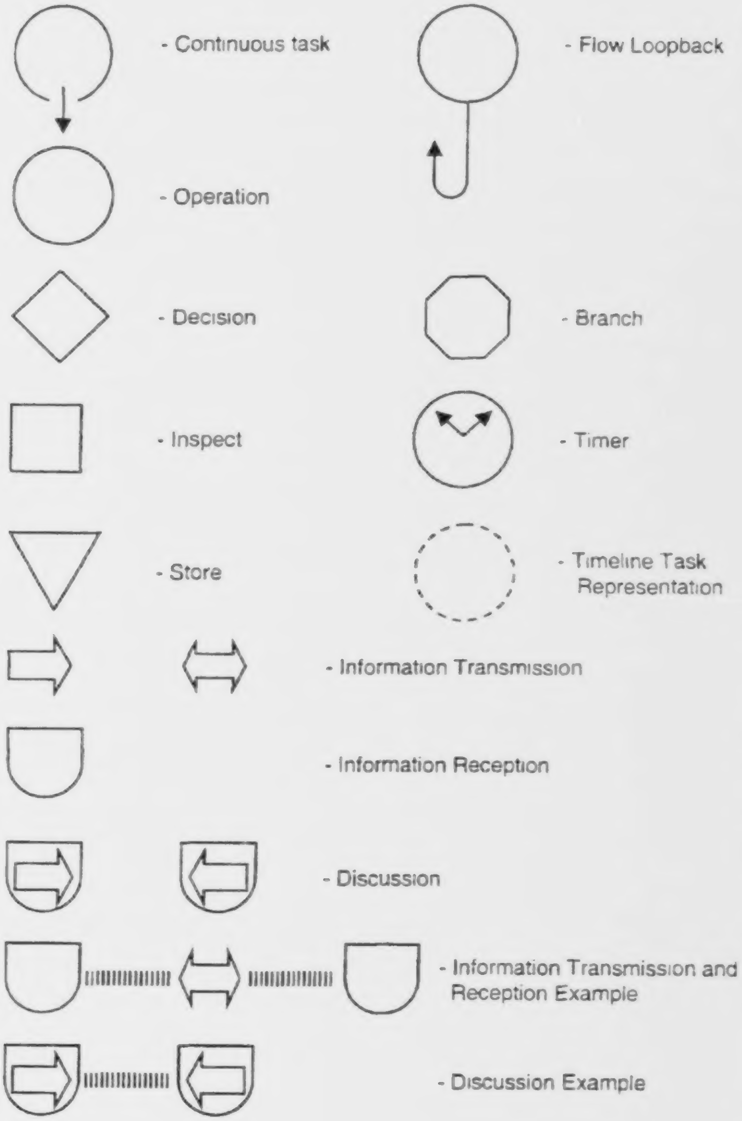
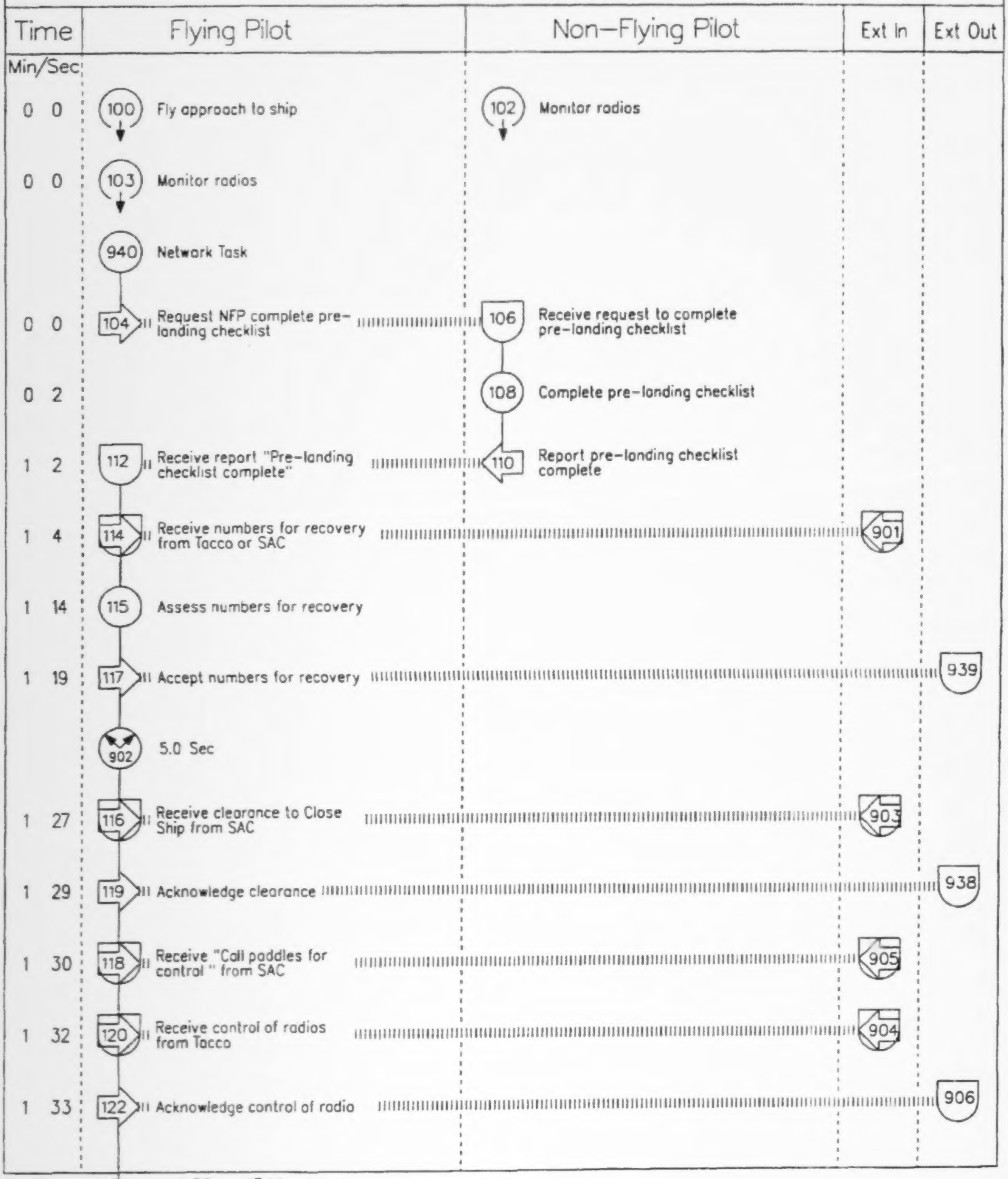


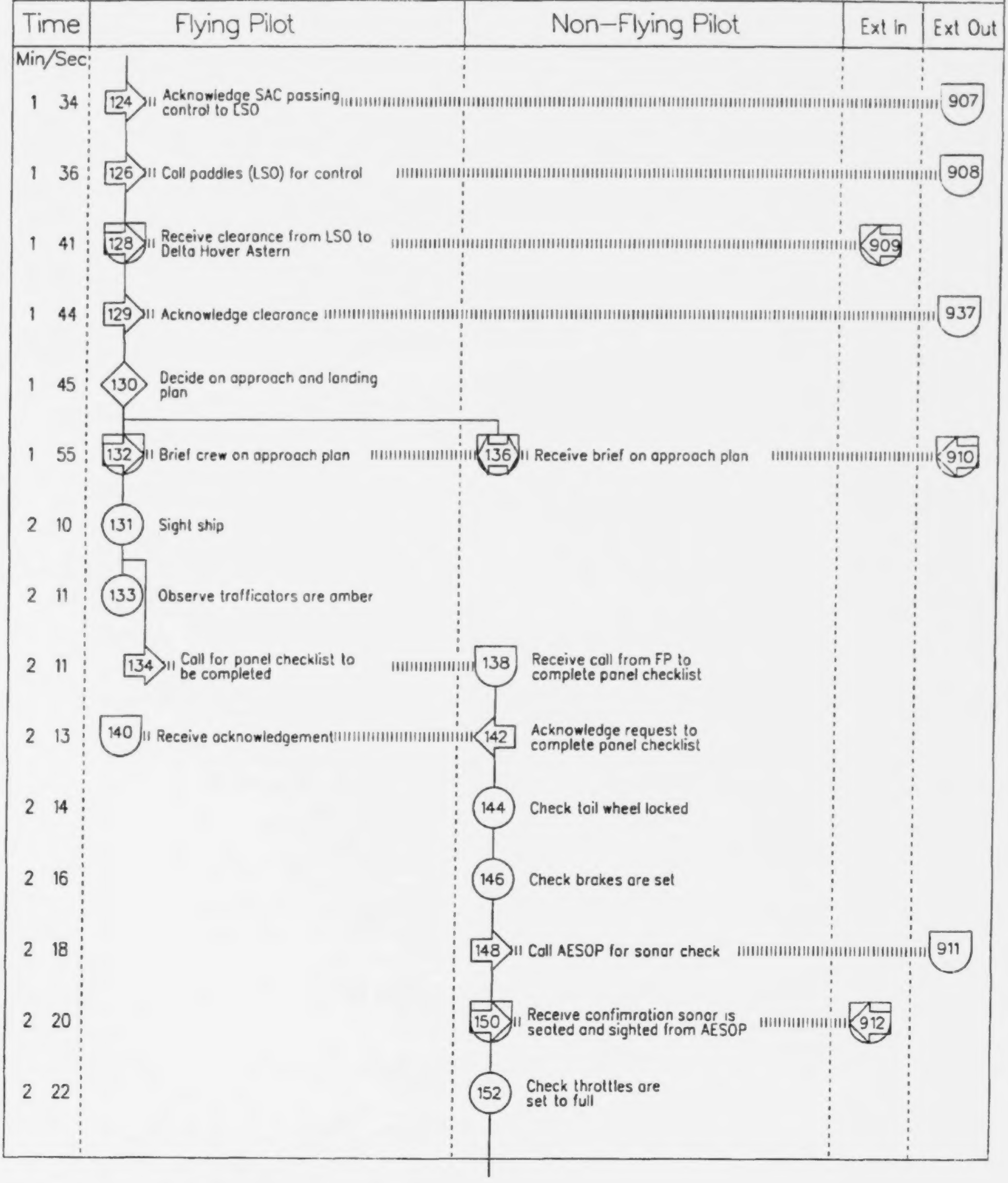
Figure G-1 **Operational Sequence Diagram Symbology**

Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
0 0
100 Fly approach to ship
102 Monitor radios
0 0
103 Monitor radios
940 Network Task
0 0
104 Request NFP complete pre-landing checklist
106 Receive request to complete pre-landing checklist
0 2
108 Complete pre-landing checklist
1 2
112 Receive report "Pre-landing checklist complete"
110 Report pre-landing checklist complete
1 4
114 Receive numbers for recovery from Tacco or SAC
901
1 14
115 Assess numbers for recovery
1 19
117 Accept numbers for recovery
939
902 5.0 Sec
1 27
116 Receive clearance to Close Ship from SAC
903
1 29
119 Acknowledge clearance
938
1 30
118 Receive "Call paddles for control" from SAC
905
1 32
120 Receive control of radios from Tacco
904
1 33
122 Acknowledge control of radio
906

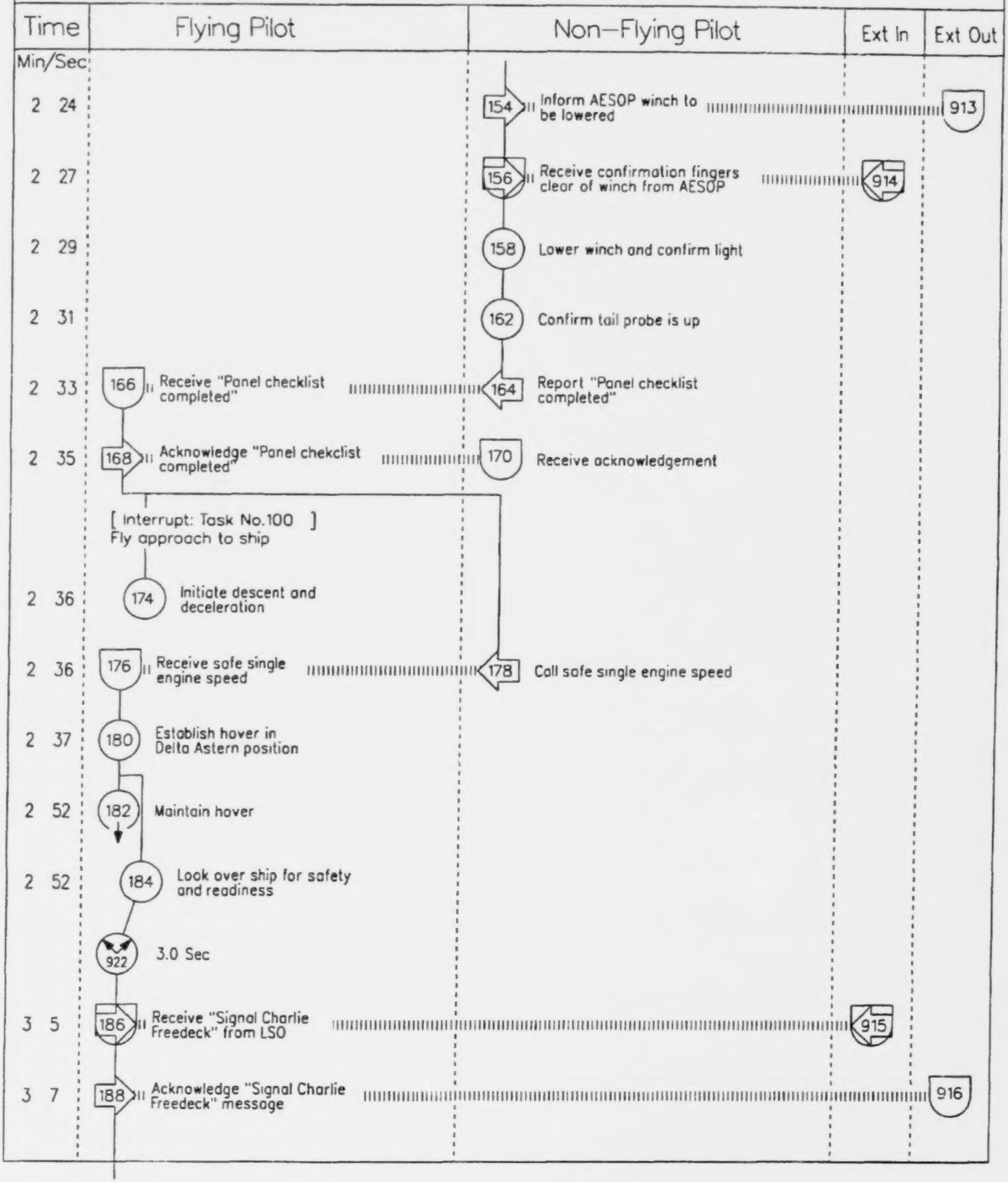
Time and Date: 11:30 13 March

Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime

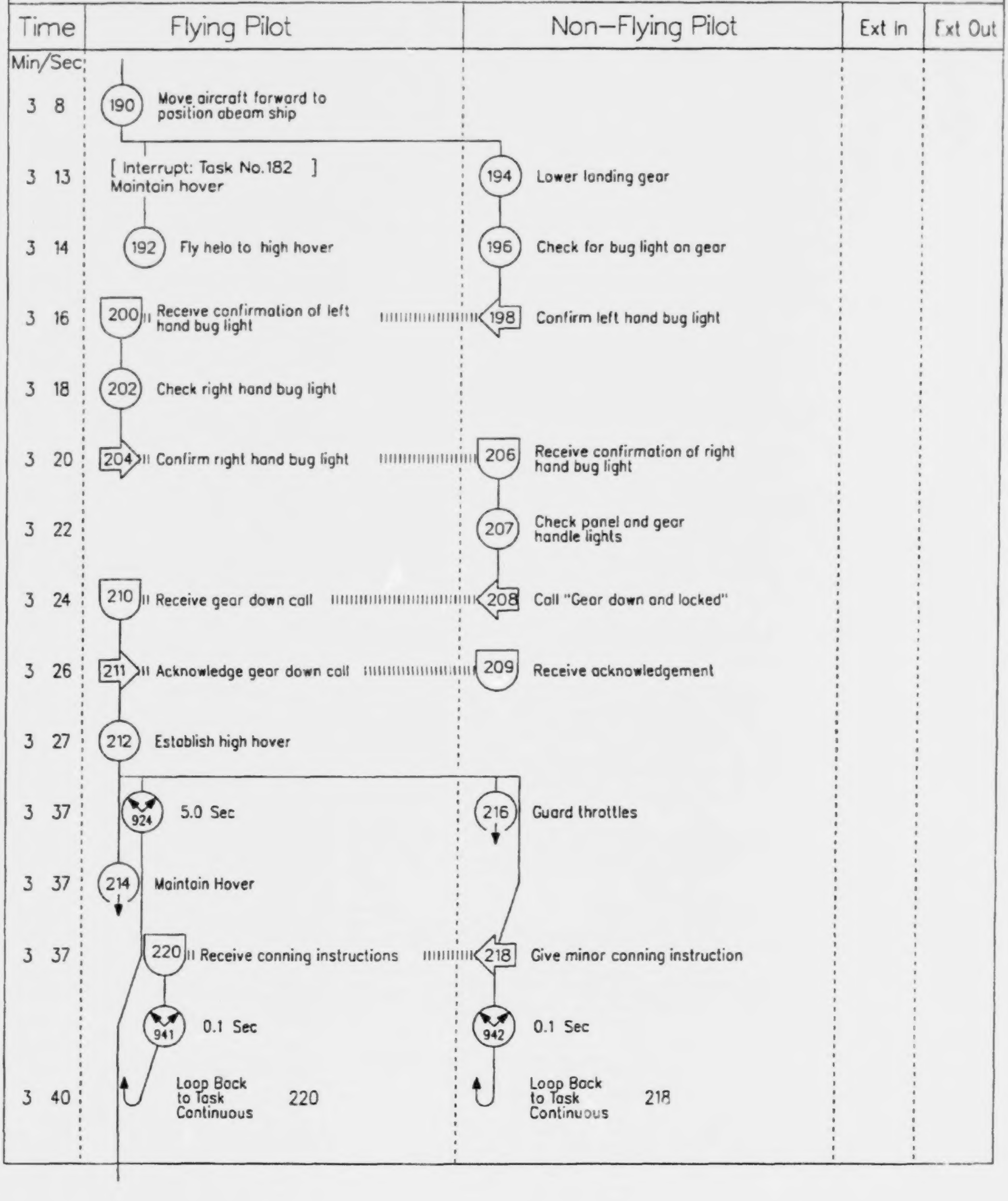


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
1 34
124
Acknowledge SAC passing control to LSO
907
1 36
126
Call paddles (LSO) for control
908
1 41
128
Receive clearance from LSO to Delta Hover Astern
909
1 44
129
Acknowledge clearance
937
1 45
130
Decide on approach and landing plan
1 55
132
Brief crew on approach plan
136
Receive brief on approach plan
910
2 10
131
Sight ship
2 11
133
Observe trafficators are amber
2 11
134
Call for panel checklist to be completed
138
Receive call from FP to complete panel checklist
2 13
140
Receive acknowledgement
142
Acknowledge request to complete panel checklist
2 14
144
Check tail wheel locked
2 16
146
Check brakes are set
2 18
148
Call AESOP for sonar check
911
2 20
150
Receive confimration sonar is seated and sighted from AESOP
912
2 22
152
Check throttles are set to full

Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime

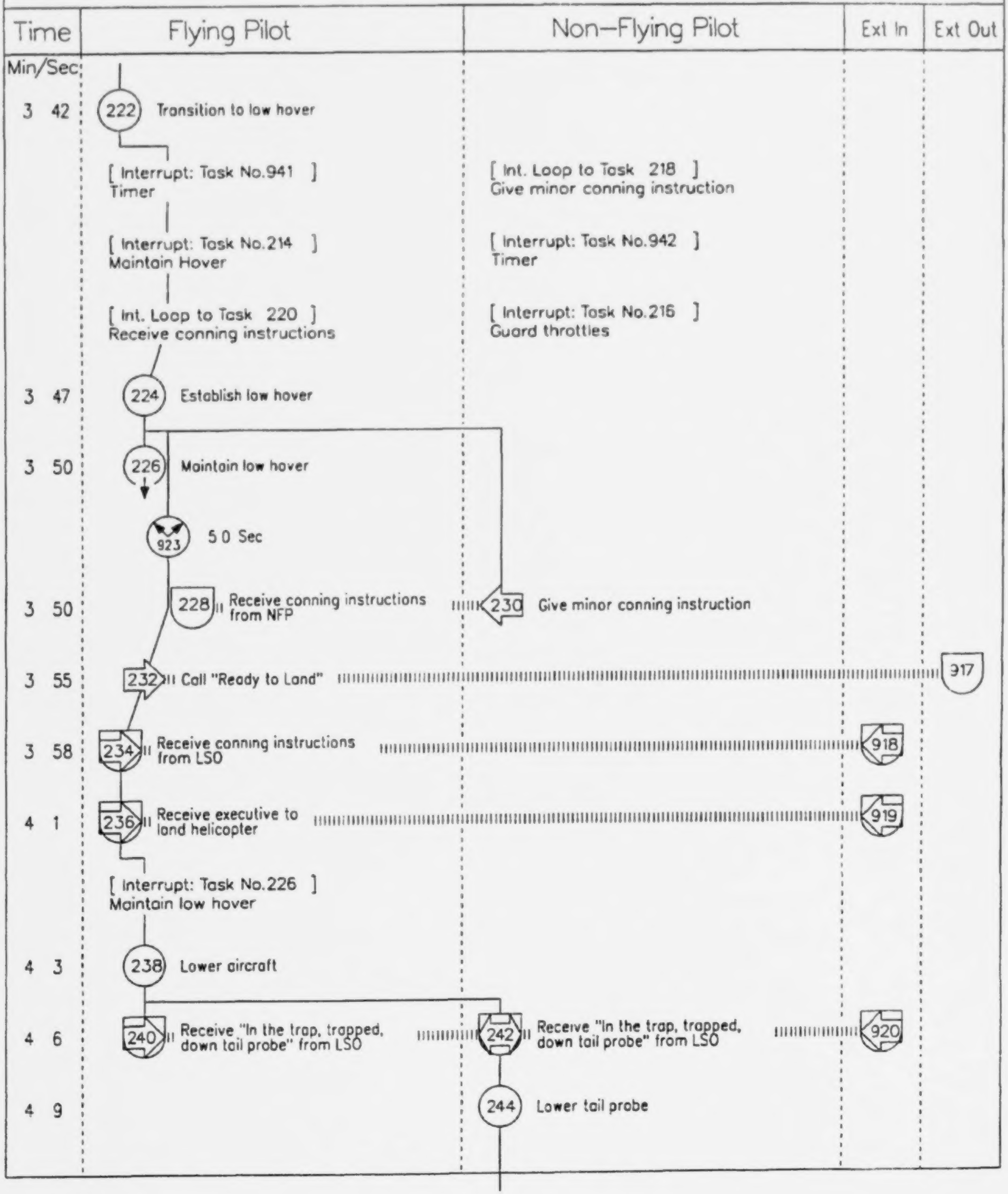

Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
2 24
154
Inform AESOP winch to be lowered
913
2 27
156
Receive confirmation fingers clear of winch from AESOP
914
2 29
158
Lower winch and confirm light
2 31
162
Confirm tail probe is up
2 33
166
Receive "Panel checklist completed"
164
Report "Panel checklist completed"
2 35
168
Acknowledge "Panel chekclist completed"
170
Receive acknowledgement
[Interrupt: Task No.100]
Fly approach to ship
2 36
174
Initiate descent and deceleration
2 36
176
Receive safe single engine speed
178
Call safe single engine speed
2 37
180
Establish hover in Delta Astern position
2 52
182
Maintain hover
2 52
184
Look over ship for safety and readiness
922
3.0 Sec
3 5
186
Receive "Signal Charlie Freedeck" from LSO
915
3 7
188
Acknowledge "Signal Charlie Freedeck" message
916

Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime

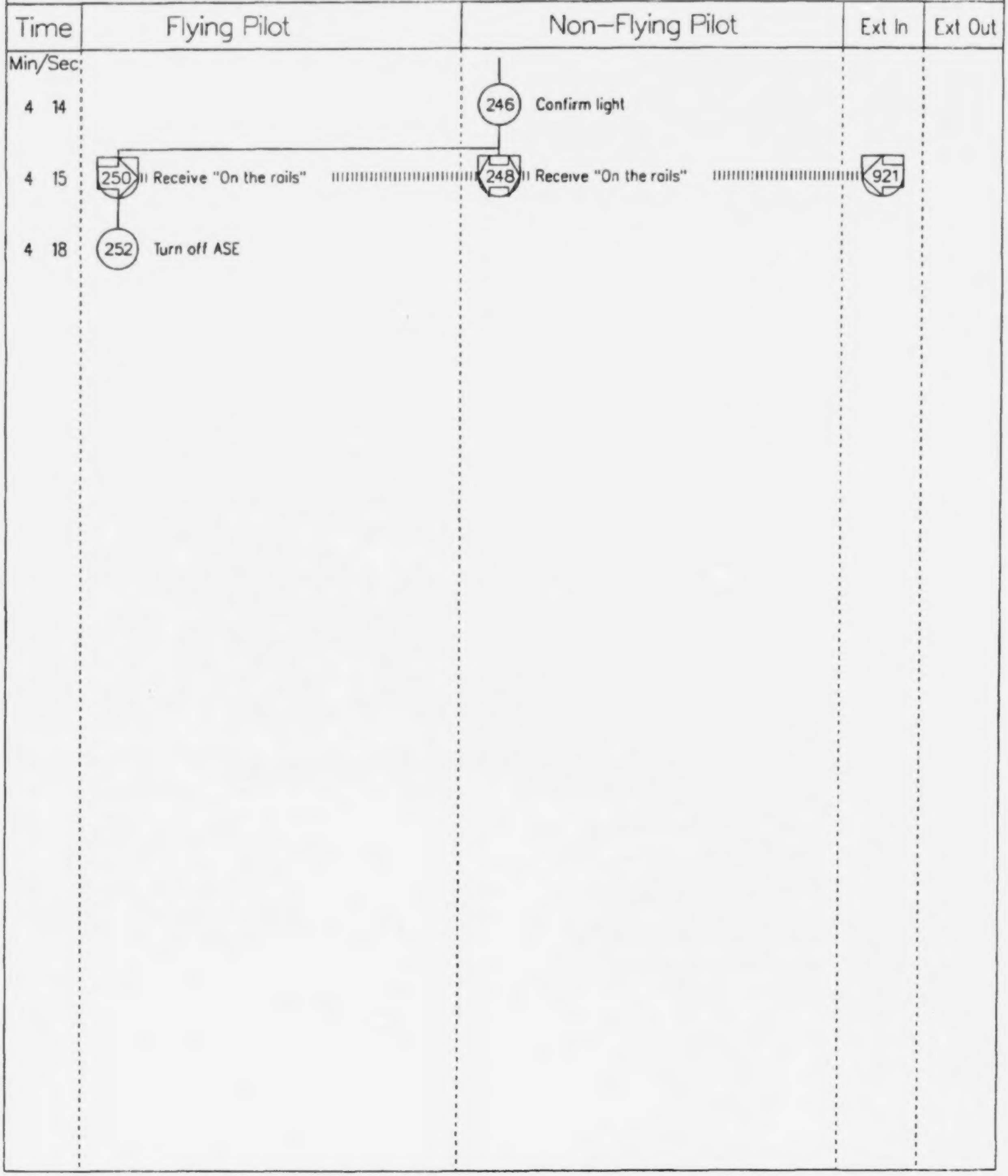


Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
3 8	190 Move aircraft forward to position abeam ship			
3 13	[Interrupt: Task No.182] Maintain hover	194 Lower landing gear		
3 14	192 Fly helo to high hover	196 Check for bug light on gear		
3 16	200 Receive confirmation of left hand bug light	198 Confirm left hand bug light		
3 18	202 Check right hand bug light			
3 20	204 Confirm right hand bug light	206 Receive confirmation of right hand bug light		
3 22		207 Check panel and gear handle lights		
3 24	210 Receive gear down call	208 Call "Gear down and locked"		
3 26	211 Acknowledge gear down call	209 Receive acknowledgement		
3 27	212 Establish high hover			
3 37	924 5.0 Sec	216 Guard throttles		
3 37	214 Maintain Hover			
3 37	220 Receive conning instructions	218 Give minor conning instruction		
	941 0.1 Sec	942 0.1 Sec		
3 40	Loop Back to Task Continuous 220	Loop Back to Task Continuous 218		

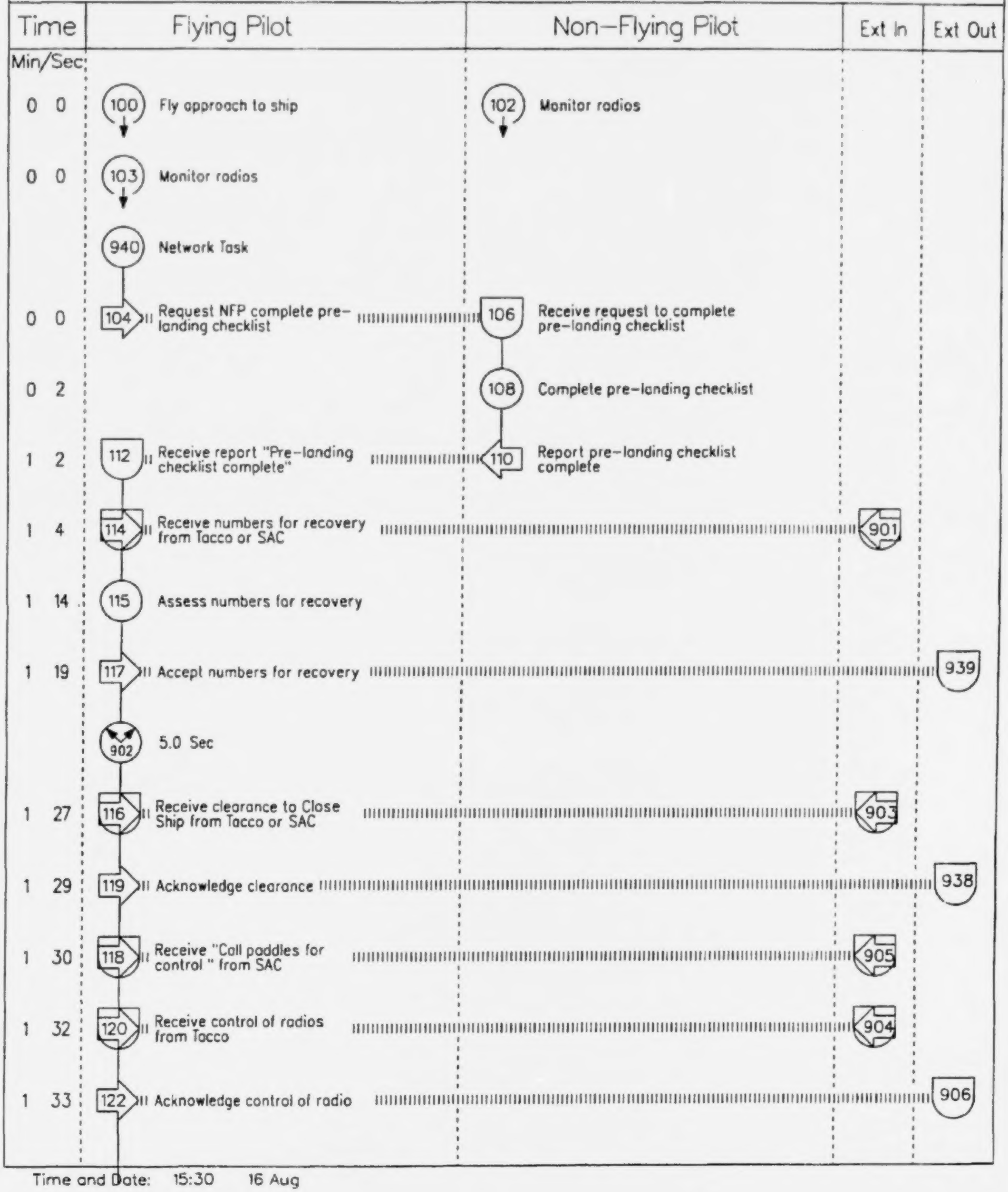
Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
3 42
222 Transition to low hover
[Interrupt: Task No.941] Timer
[Int. Loop to Task 218] Give minor conning instruction
[Interrupt: Task No.214] Maintain Hover
[Interrupt: Task No.942] Timer
[Int. Loop to Task 220] Receive conning instructions
[Interrupt: Task No.216] Guard throttles
3 47
224 Establish low hover
3 50
226 Maintain low hover
923 5 0 Sec
3 50
228 Receive conning instructions from NFP
230 Give minor conning instruction
3 55
232 Call "Ready to Land"
917
3 58
234 Receive conning instructions from LSO
918
4 1
236 Receive executive to land helicopter
919
[Interrupt: Task No.226] Maintain low hover
4 3
238 Lower aircraft
4 6
240 Receive "In the trap, trapped, down tail probe" from LSO
242 Receive "In the trap, trapped, down tail probe" from LSO
920
4 9
244 Lower tail probe

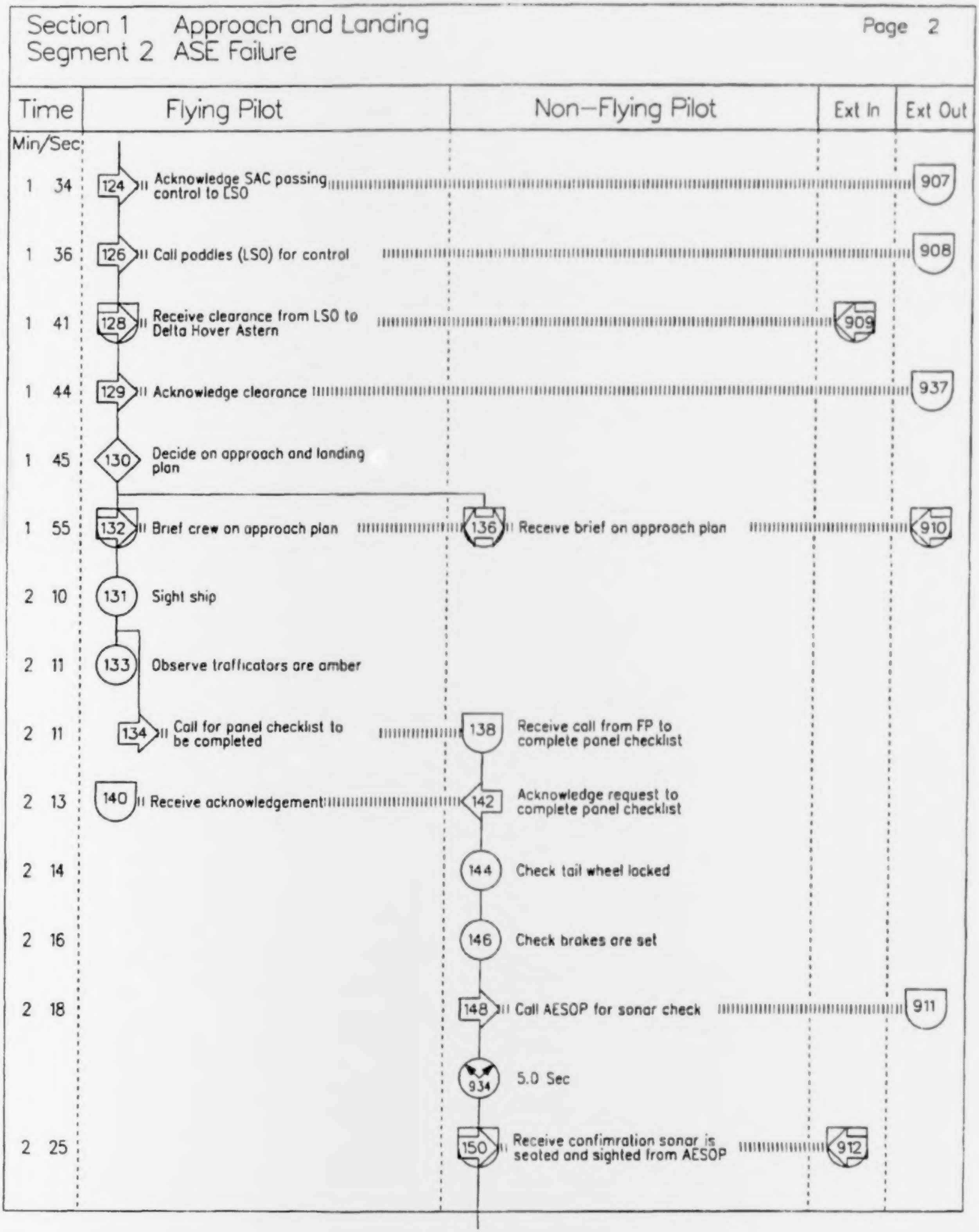
Section 1 Approach and Landing
Segment 1 Freedeck Landing – Daytime



Section 1 Approach and Landing
Segment 2 ASE Failure


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
0 0
100 Fly approach to ship
102 Monitor radios
0 0
103 Monitor radios
940 Network Task
0 0
104 Request NFP complete pre-landing checklist
106 Receive request to complete pre-landing checklist
0 2
108 Complete pre-landing checklist
1 2
112 Receive report "Pre-landing checklist complete"
110 Report pre-landing checklist complete
1 4
114 Receive numbers for recovery from Tacco or SAC
901
1 14
115 Assess numbers for recovery
1 19
117 Accept numbers for recovery
939
902 5.0 Sec
1 27
116 Receive clearance to Close Ship from Tacco or SAC
903
1 29
119 Acknowledge clearance
938
1 30
118 Receive "Call paddles for control " from SAC
905
1 32
120 Receive control of radios from Tacco
904
1 33
122 Acknowledge control of radio
906

Time and Date: 15:30 16 Aug

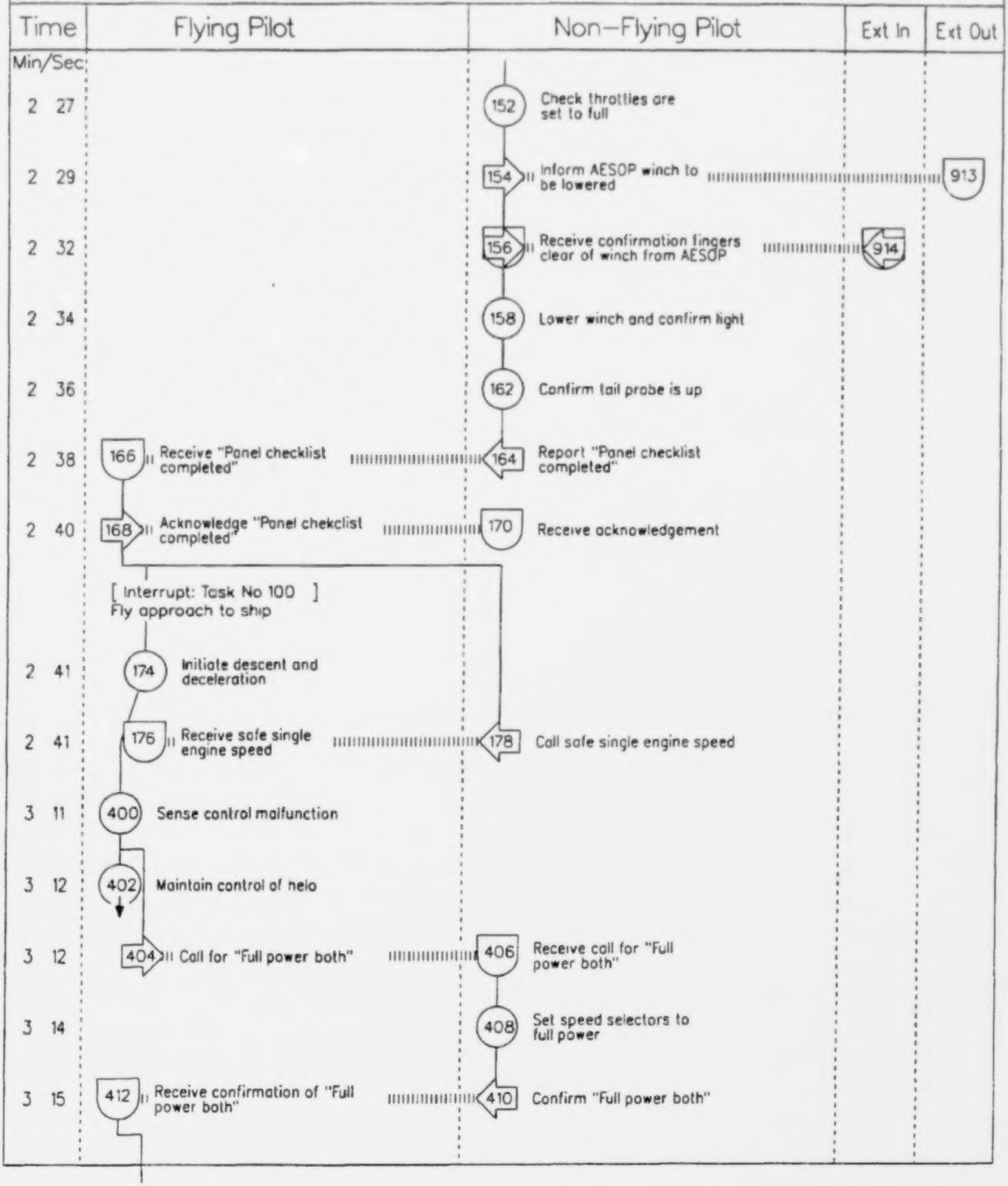


Section 1 Approach and Landing
Segment 2 ASE Failure

Page 2

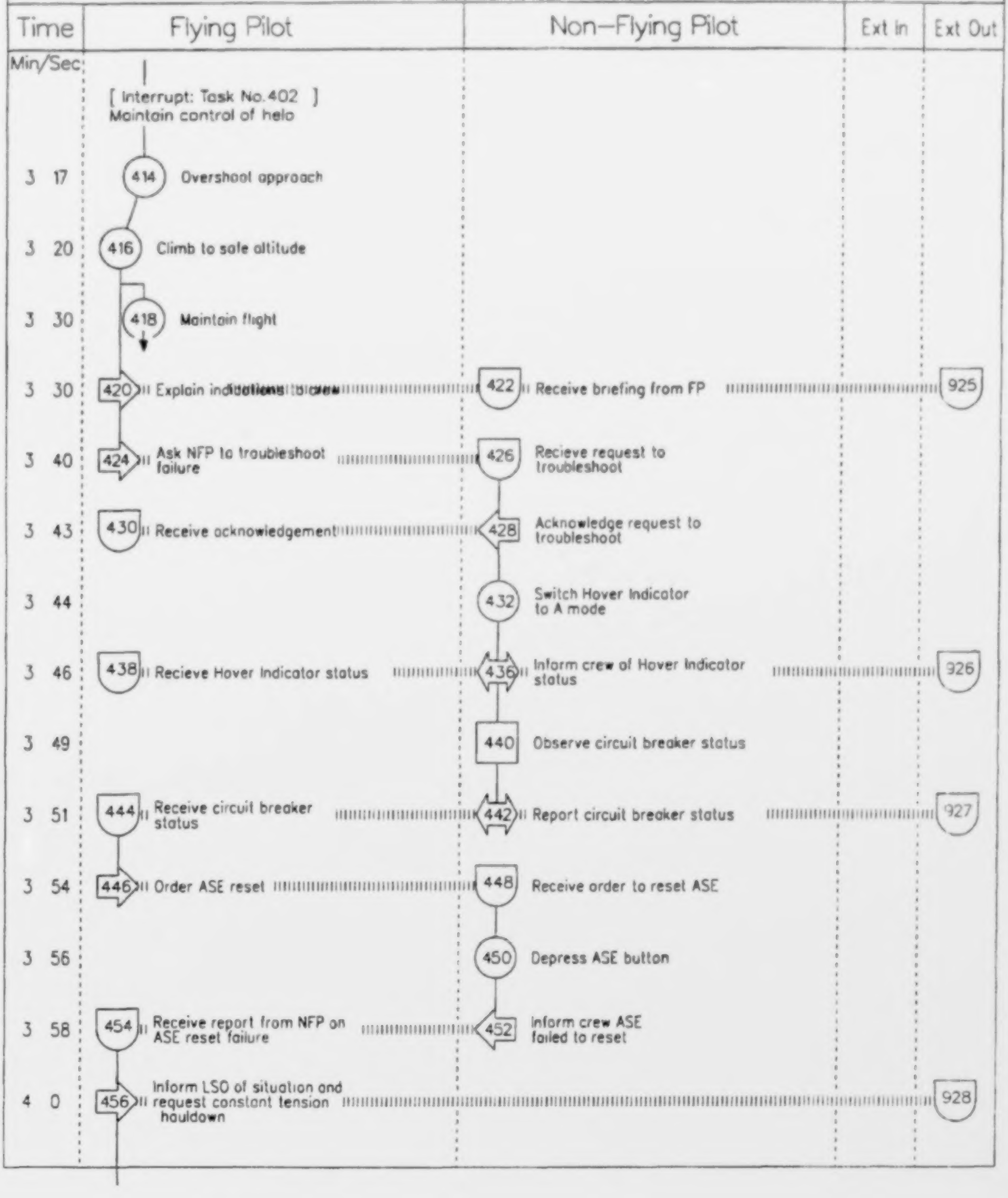
Time	Flying Pilot	Non-Flying Pilot	Ext In	Ext Out
Min/Sec				
1 34	124 Acknowledge SAC passing control to LSO			907
1 36	126 Call paddles (LSO) for control			908
1 41	128 Receive clearance from LSO to Delta Hover Astern		909	
1 44	129 Acknowledge clearance			937
1 45	130 Decide on approach and landing plan			
1 55	132 Brief crew on approach plan	136 Receive brief on approach plan		910
2 10	131 Sight ship			
2 11	133 Observe trafficators are amber			
2 11	134 Call for panel checklist to be completed	138 Receive call from FP to complete panel checklist		
2 13	140 Receive acknowledgement	142 Acknowledge request to complete panel checklist		
2 14		144 Check tail wheel locked		
2 16		146 Check brakes are set		
2 18		148 Call AESOP for sonar check		911
		934 5.0 Sec		
2 25		150 Receive confimration sonar is seated and sighted from AESOP	912	

Section 1 Approach and Landing
Segment 2 ASE Failure



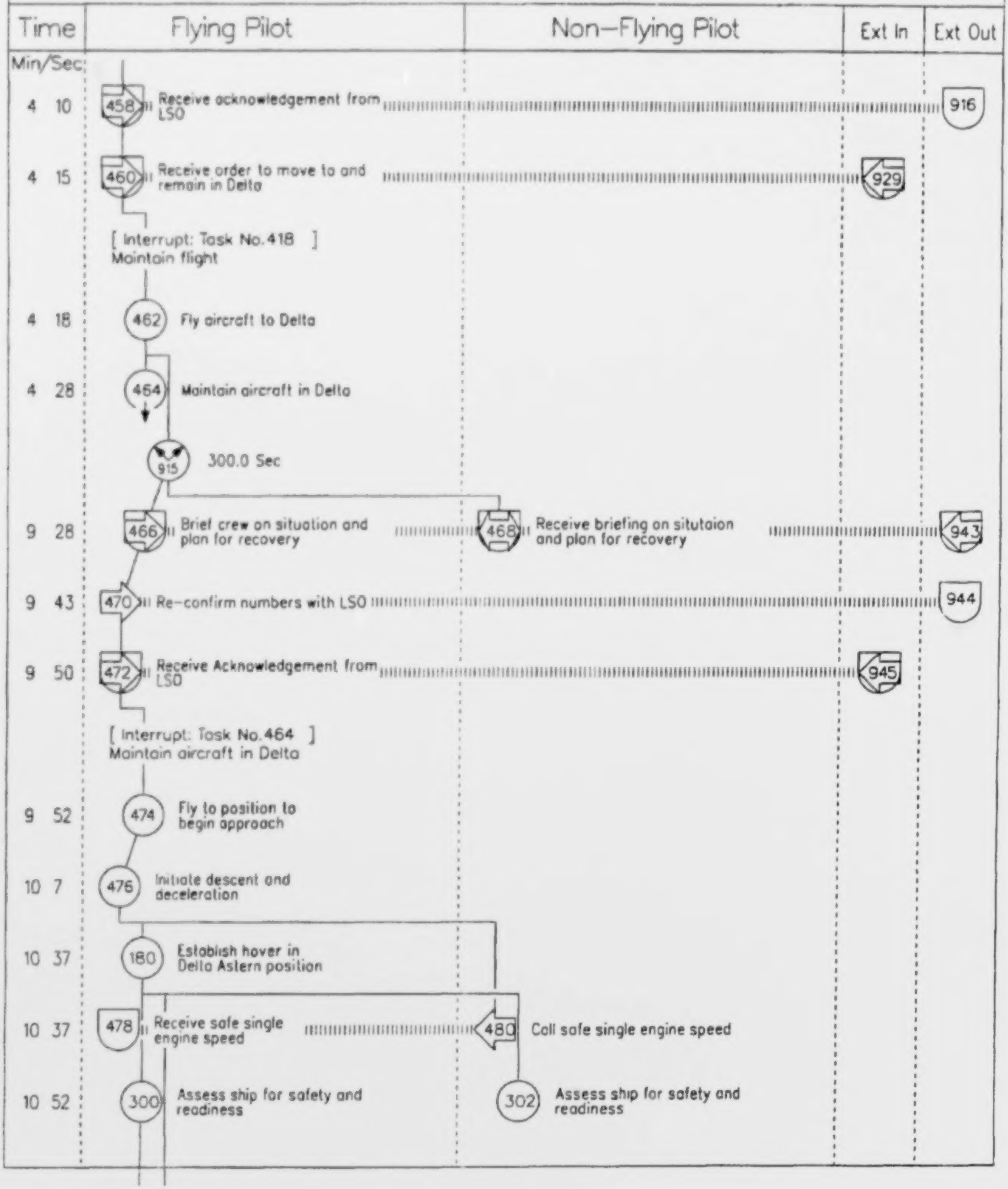
Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
2 27		152 Check throttles are set to full		
2 29		154 Inform AESOP winch to be lowered		913
2 32		156 Receive confirmation fingers clear of winch from AESOP	914	
2 34		158 Lower winch and confirm light		
2 36		162 Confirm tail probe is up		
2 38	166 Receive "Panel checklist completed"	164 Report "Panel checklist completed"		
2 40	168 Acknowledge "Panel chekclist completed"	170 Receive acknowledgement		
	[Interrupt: Task No 100] Fly approach to ship			
2 41	174 Initiate descent and deceleration			
2 41	176 Receive safe single engine speed	178 Call safe single engine speed		
3 11	400 Sense control malfunction			
3 12	402 Maintain control of helo			
3 12	404 Call for "Full power both"	406 Receive call for "Full power both"		
3 14		408 Set speed selectors to full power		
3 15	412 Receive confirmation of "Full power both"	410 Confirm "Full power both"		

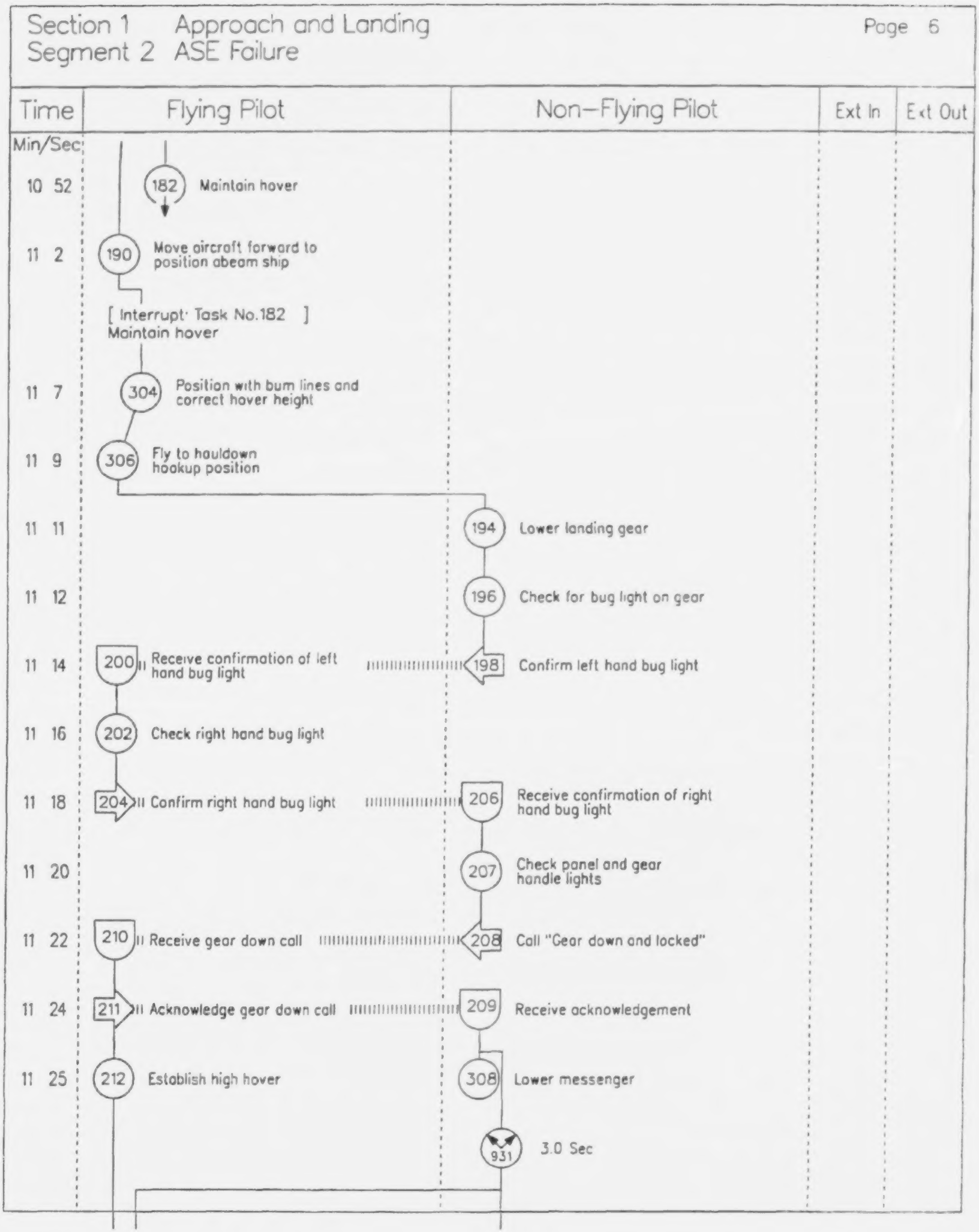
Section 1 Approach and Landing
Segment 2 ASE Failure



Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
	[Interrupt: Task No.402] Maintain control of helo			
3 17	414 Overshoot approach			
3 20	416 Climb to safe altitude			
3 30	418 Maintain flight			
3 30	420 Explain indications to crew	422 Receive briefing from FP		925
3 40	424 Ask NFP to troubleshoot failure	426 Recieve request to troubleshoot		
3 43	430 Receive acknowledgement	428 Acknowledge request to troubleshoot		
3 44		432 Switch Hover Indicator to A mode		
3 46	438 Recieve Hover Indicator status	436 Inform crew of Hover Indicator status		926
3 49		440 Observe circuit breaker status		
3 51	444 Receive circuit breaker status	442 Report circuit breaker status		927
3 54	446 Order ASE reset	448 Receive order to reset ASE		
3 56		450 Depress ASE button		
3 58	454 Receive report from NFP on ASE reset failure	452 Inform crew ASE failed to reset		
4 0	456 Inform LSO of situation and request constant tension hauldown			928

Section 1 Approach and Landing
Segment 2 ASE Failure

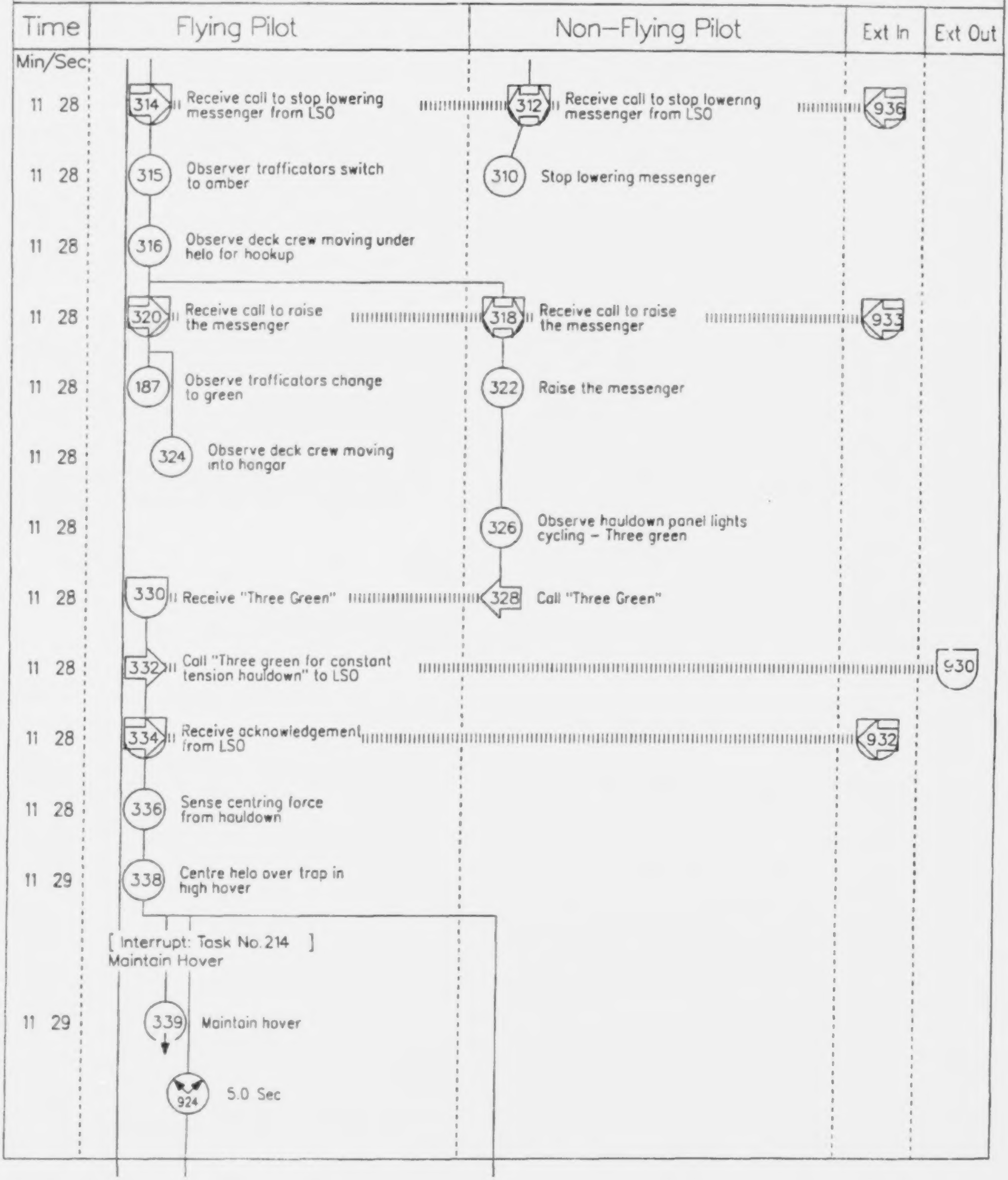

Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
4 10
458
Receive acknowledgement from LSO
916
4 15
460
Receive order to move to and remain in Delta
929
[Interrupt: Task No.418]
Maintain flight
4 18
462
Fly aircraft to Delta
4 28
464
Maintain aircraft in Delta
915
300.0 Sec
9 28
466
Brief crew on situation and plan for recovery
468
Receive briefing on situtaion and plan for recovery
943
9 43
470
Re-confirm numbers with LSO
944
9 50
472
Receive Acknowledgement from LSO
945
[Interrupt: Task No.464]
Maintain aircraft in Delta
9 52
474
Fly to position to begin approach
10 7
476
Initiate descent and deceleration
10 37
180
Establish hover in Delta Astern position
10 37
478
Receive safe single engine speed
480
Call safe single engine speed
10 52
300
Assess ship for safety and readiness
302
Assess ship for safety and readiness



Section 1 Approach and Landing
Segment 2 ASE Failure

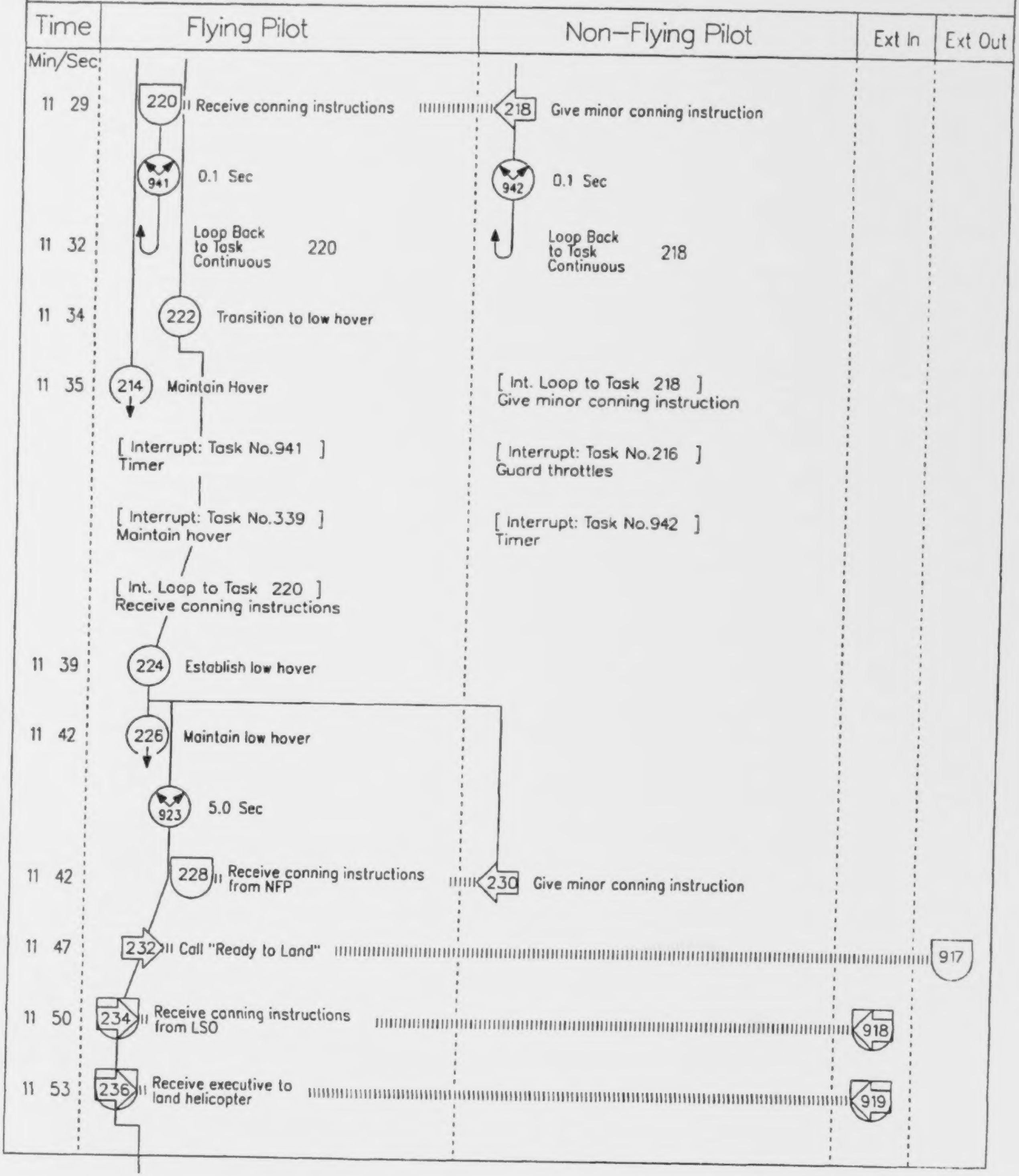
Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
10 52	182 Maintain hover			
11 2	190 Move aircraft forward to position abeam ship			
	[Interrupt· Task No.182] Maintain hover			
11 7	304 Position with bum lines and correct hover height			
11 9	306 Fly to hauldown hookup position			
11 11		194 Lower landing gear		
11 12		196 Check for bug light on gear		
11 14	200 Receive confirmation of left hand bug light	198 Confirm left hand bug light		
11 16	202 Check right hand bug light			
11 18	204 Confirm right hand bug light	206 Receive confirmation of right hand bug light		
11 20		207 Check panel and gear handle lights		
11 22	210 Receive gear down call	208 Call "Gear down and locked"		
11 24	211 Acknowledge gear down call	209 Receive acknowledgement		
11 25	212 Establish high hover	308 Lower messenger		
		931 3.0 Sec		

Section 1 Approach and Landing
Segment 2 ASE Failure

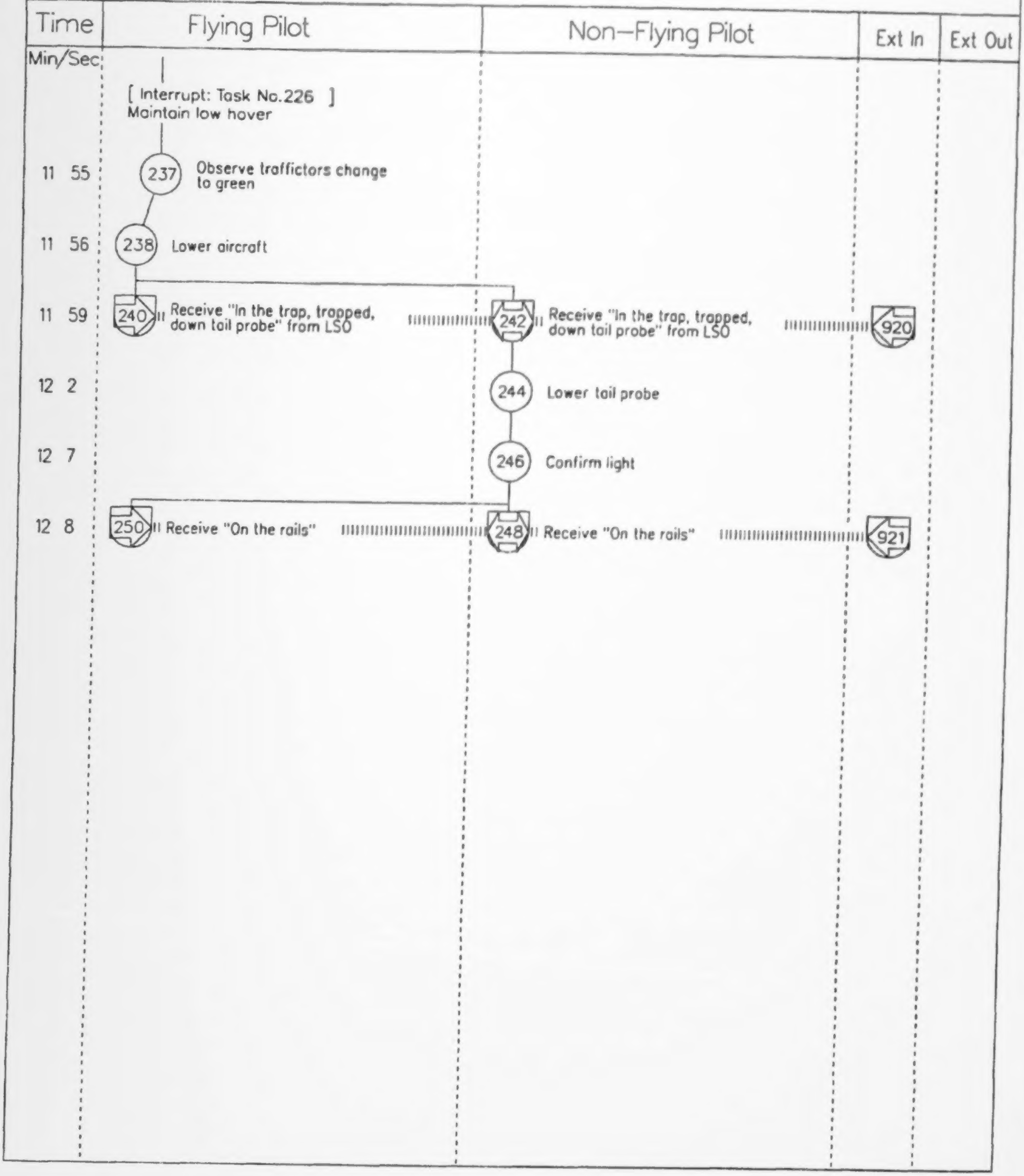


Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
11 28	314 Receive call to stop lowering messenger from LSO	312 Receive call to stop lowering messenger from LSO	936	
11 28	315 Observer trafficators switch to amber	310 Stop lowering messenger		
11 28	316 Observe deck crew moving under helo for hookup			
11 28	320 Receive call to raise the messenger	318 Receive call to raise the messenger	933	
11 28	187 Observe trafficators change to green	322 Raise the messenger		
11 28	324 Observe deck crew moving into hangar			
11 28		326 Observe hauldown panel lights cycling – Three green		
11 28	330 Receive "Three Green"	328 Call "Three Green"		
11 28	332 Call "Three green for constant tension hauldown" to LSO			930
11 28	334 Receive acknowledgement from LSO		932	
11 28	336 Sense centring force from hauldown			
11 29	338 Centre helo over trap in high hover			
	[Interrupt: Task No. 214] Maintain Hover			
11 29	339 Maintain hover			
	924 5.0 Sec			

Section 1 Approach and Landing
Segment 2 ASE Failure


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
11 29
220
Receive conning instructions
218
Give minor conning instruction
941
0.1 Sec
942
0.1 Sec
11 32
Loop Back to Task Continuous 220
Loop Back to Task Continuous 218
11 34
222
Transition to low hover
11 35
214
Maintain Hover
[Int. Loop to Task 218] Give minor conning instruction
[Interrupt: Task No.941] Timer
[Interrupt: Task No.216] Guard throttles
[Interrupt: Task No.339] Maintain hover
[Interrupt: Task No.942] Timer
[Int. Loop to Task 220] Receive conning instructions
11 39
224
Establish low hover
11 42
226
Maintain low hover
923
5.0 Sec
11 42
228
Receive conning instructions from NFP
230
Give minor conning instruction
11 47
232
Call "Ready to Land"
917
11 50
234
Receive conning instructions from LSO
918
11 53
236
Receive executive to land helicopter
919

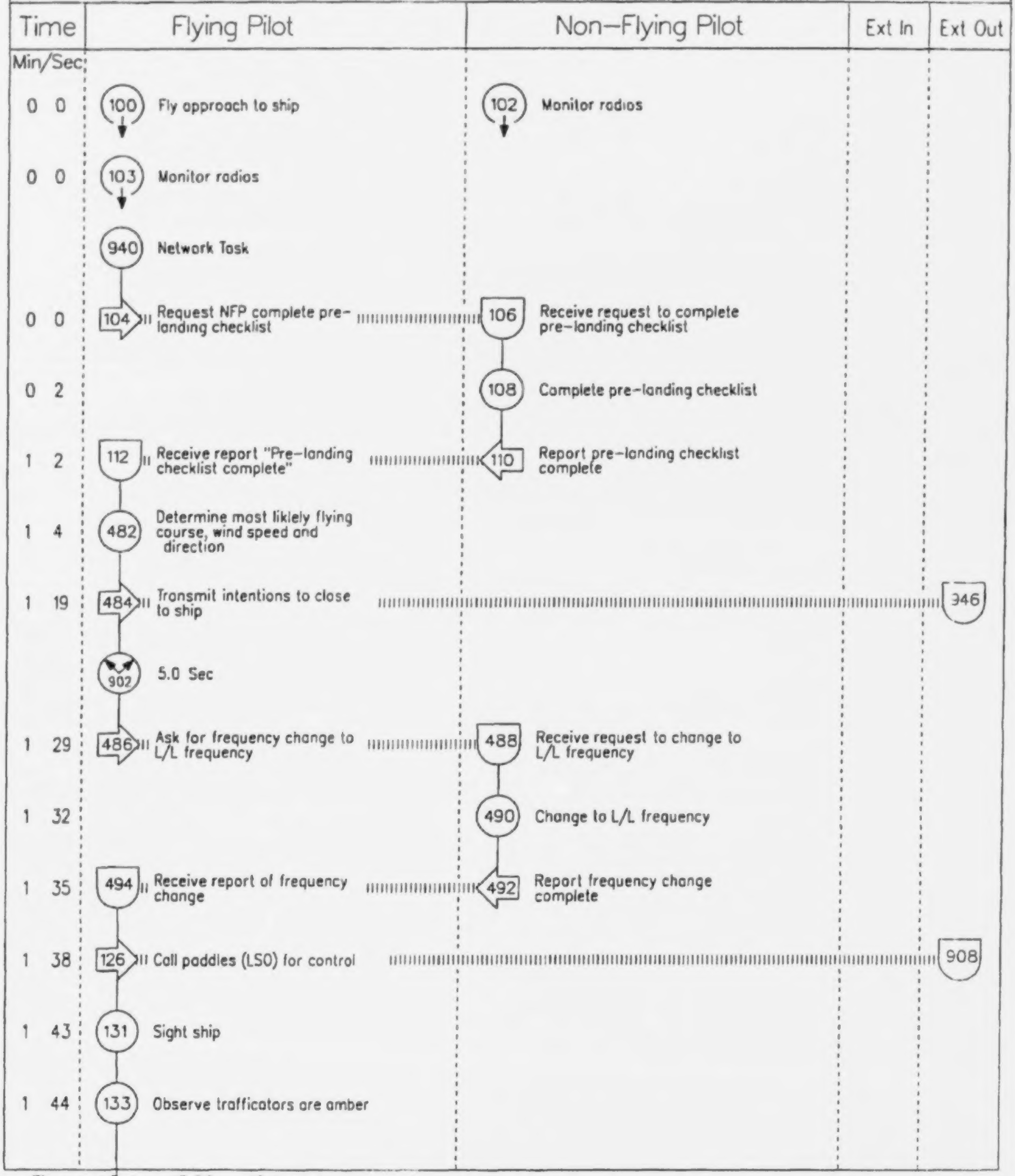
Section 1 Approach and Landing
Segment 2 ASE Failure



Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
	[Interrupt: Task No.226] Maintain low hover			
11 55	237 Observe traffictors change to green			
11 56	238 Lower aircraft			
11 59	240 Receive "In the trap, trapped, down tail probe" from LSO	242 Receive "In the trap, trapped, down tail probe" from LSO	920	
12 2		244 Lower tail probe		
12 7		246 Confirm light		
12 8	250 Receive "On the rails"	248 Receive "On the rails"	921	

Section 1 Approach and Landing
Segment 3 Comms Failure

Page 1

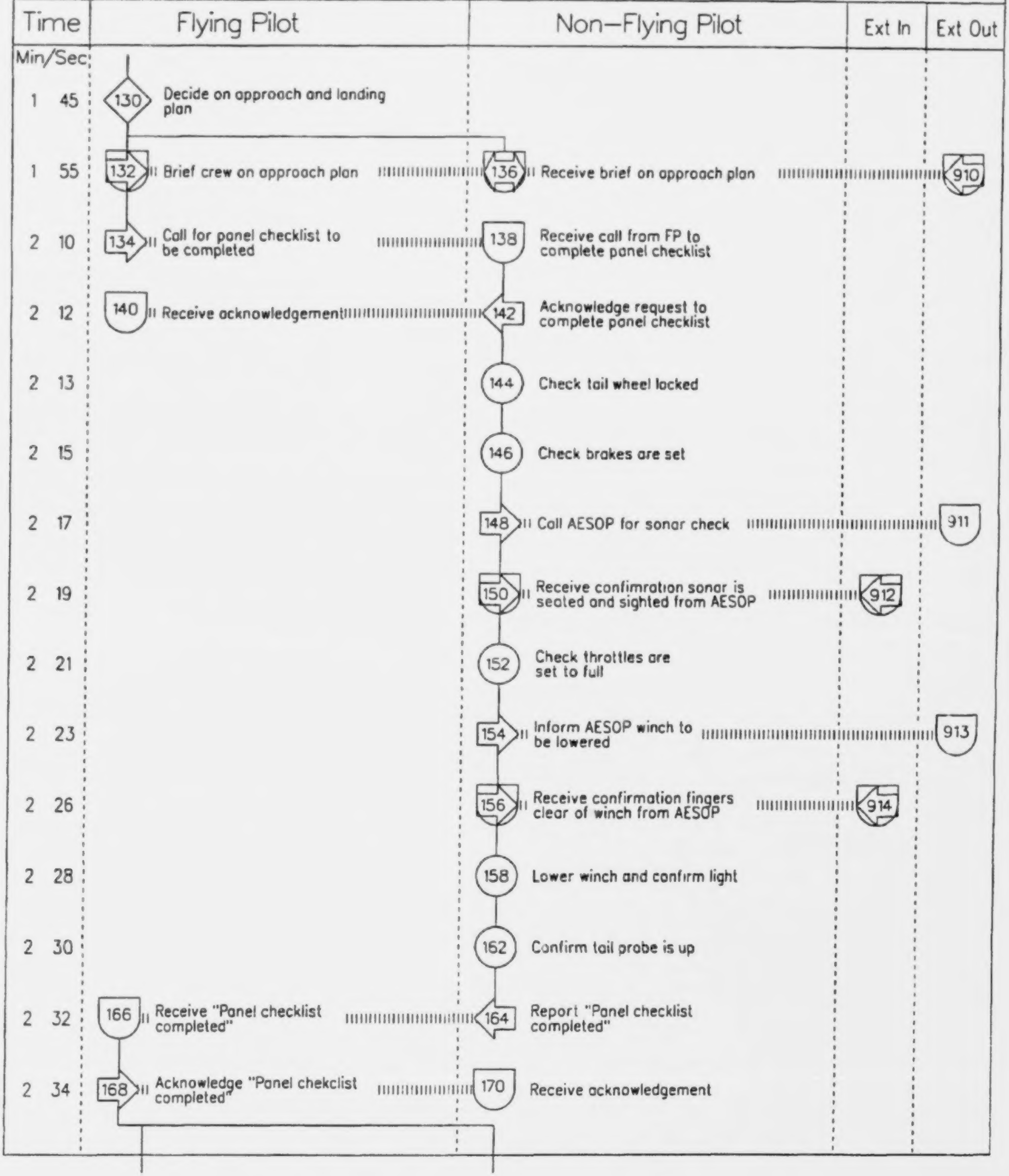


Time Min/Sec	Flying Pilot	Non-Flying Pilot	Ext In	Ext Out
0 0	100 Fly approach to ship	102 Monitor radios		
0 0	103 Monitor radios			
	940 Network Task			
0 0	104 Request NFP complete pre-landing checklist	106 Receive request to complete pre-landing checklist		
0 2		108 Complete pre-landing checklist		
1 2	112 Receive report "Pre-landing checklist complete"	110 Report pre-landing checklist complete		
1 4	482 Determine most liklely flying course, wind speed and direction			
1 19	484 Transmit intentions to close to ship			346
	902 5.0 Sec			
1 29	486 Ask for frequency change to L/L frequency	488 Receive request to change to L/L frequency		
1 32		490 Change to L/L frequency		
1 35	494 Receive report of frequency change	492 Report frequency change complete		
1 38	126 Call paddles (LSO) for control			908
1 43	131 Sight ship			
1 44	133 Observe trafficators are amber			

Time and Date: 15:30 16 August

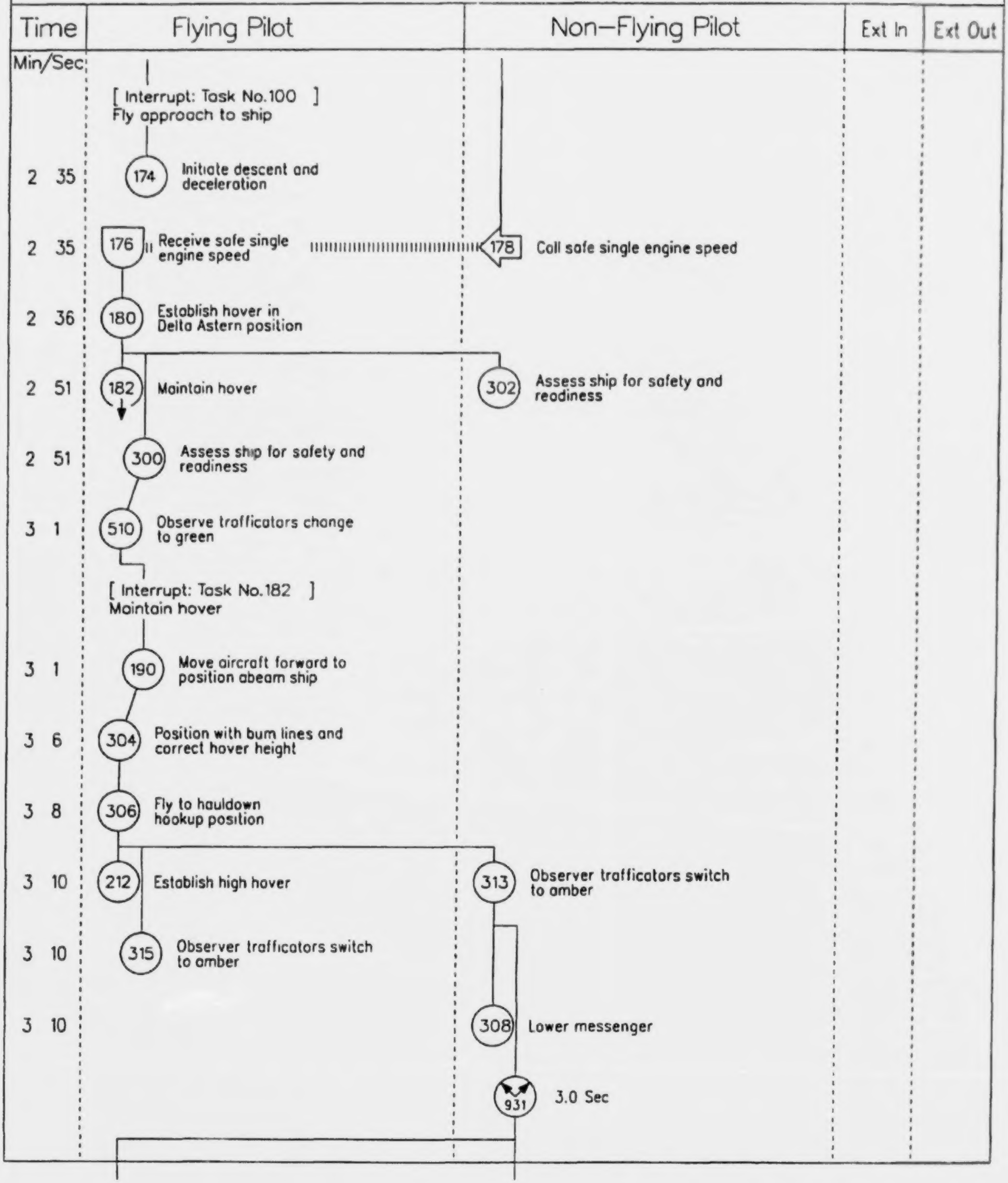
Section 1 Approach and Landing
Segment 3 Comms Failure

Page 2



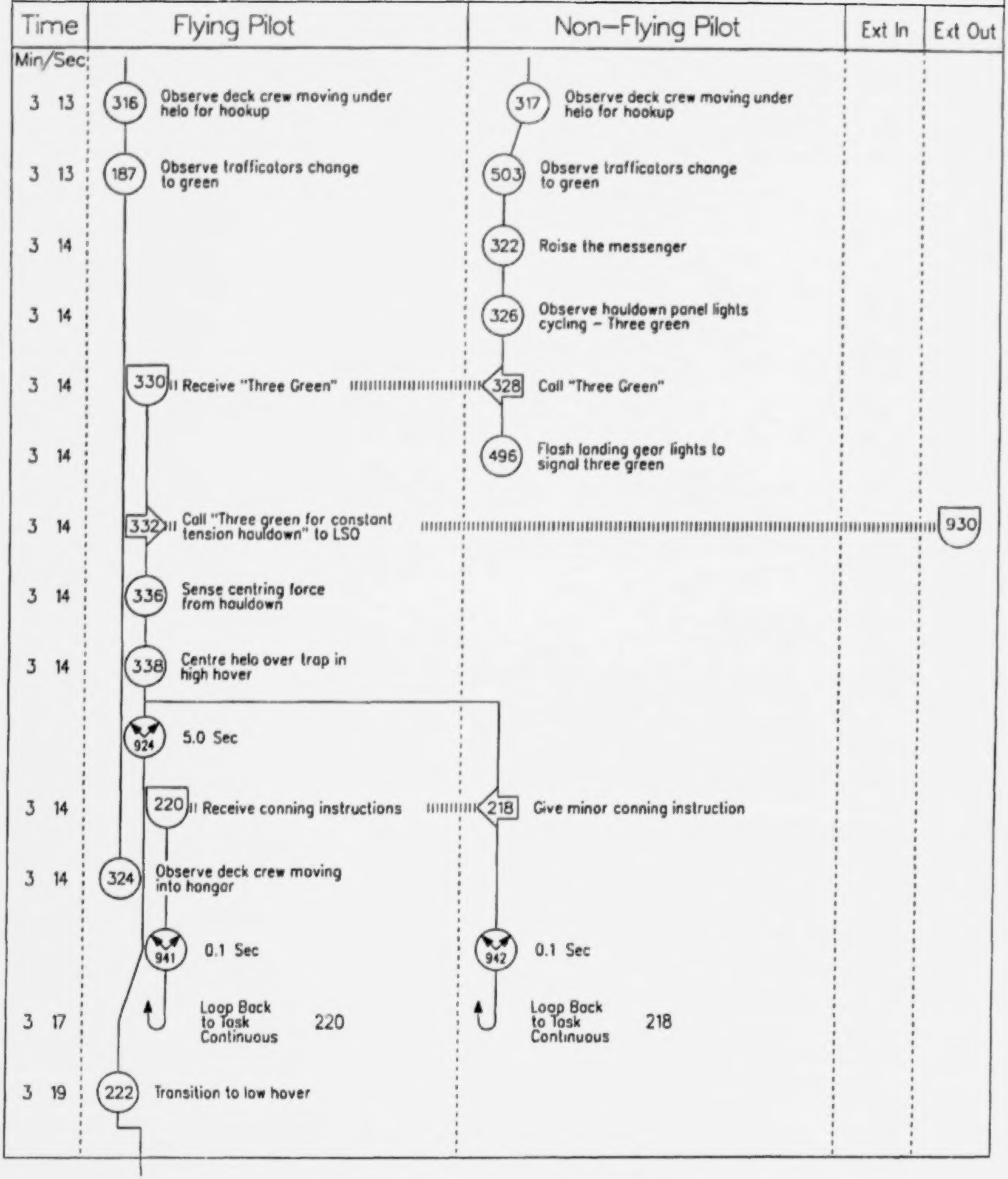
Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
1 45	130 Decide on approach and landing plan			
1 55	132 Brief crew on approach plan	136 Receive brief on approach plan		910
2 10	134 Call for panel checklist to be completed	138 Receive call from FP to complete panel checklist		
2 12	140 Receive acknowledgement	142 Acknowledge request to complete panel checklist		
2 13		144 Check tail wheel locked		
2 15		146 Check brakes are set		
2 17		148 Call AESOP for sonar check		911
2 19		150 Receive confimration sonar is sealed and sighted from AESOP	912	
2 21		152 Check throttles are set to full		
2 23		154 Inform AESOP winch to be lowered		913
2 26		156 Receive confirmation fingers clear of winch from AESOP	914	
2 28		158 Lower winch and confirm light		
2 30		162 Confirm tail probe is up		
2 32	166 Receive "Panel checklist completed"	164 Report "Panel checklist completed"		
2 34	168 Acknowledge "Panel chekclist completed"	170 Receive acknowledgement		

Section 1 Approach and Landing
Segment 3 Comms Failure



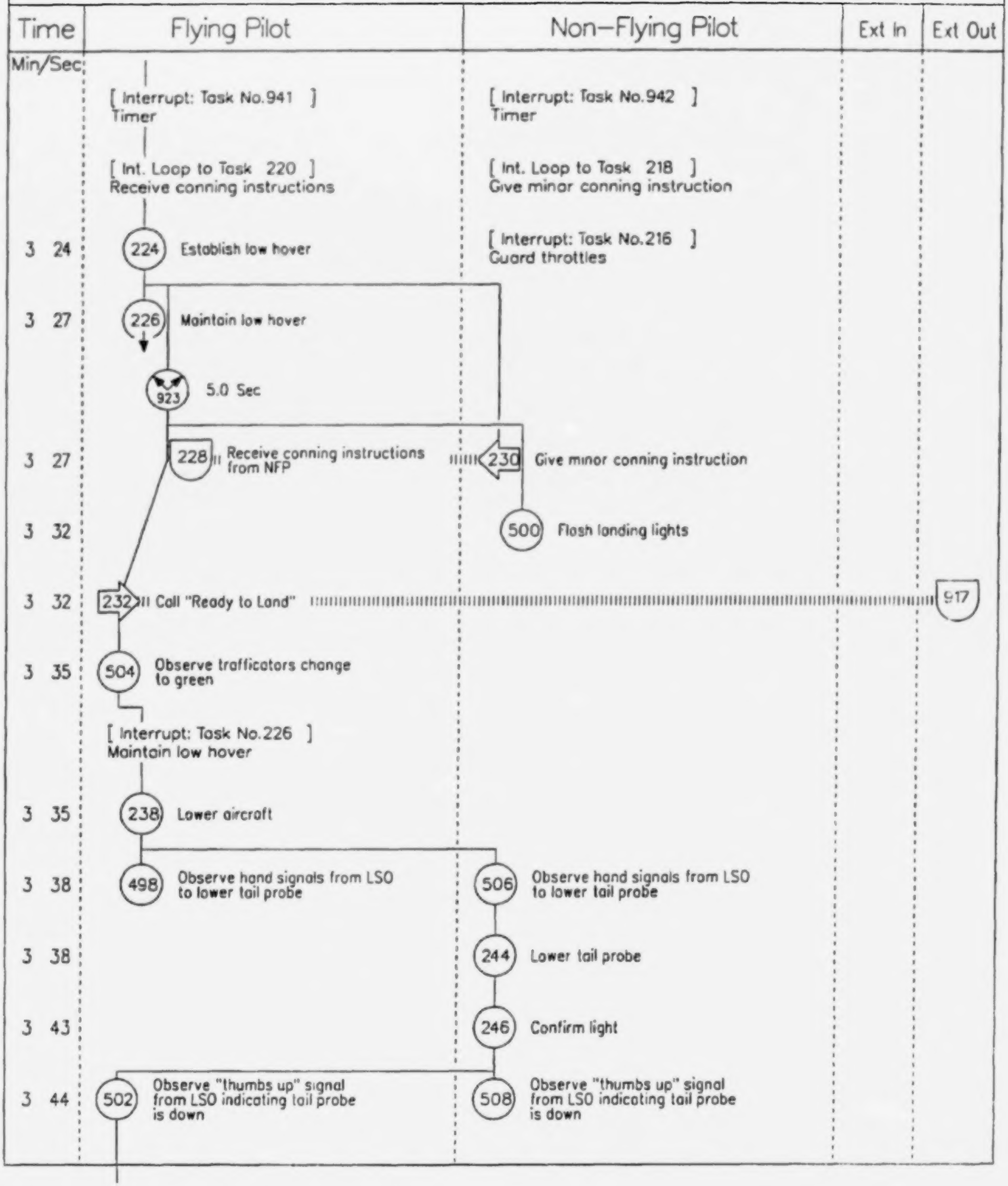
Time Min/Sec	Flying Pilot	Non–Flying Pilot	Ext In	Ext Out
	[Interrupt: Task No.100] Fly approach to ship			
2 35	174 Initiate descent and deceleration			
2 35	176 Receive safe single engine speed	178 Call safe single engine speed		
2 36	180 Establish hover in Delta Astern position			
2 51	182 Maintain hover	302 Assess ship for safety and readiness		
2 51	300 Assess ship for safety and readiness			
3 1	510 Observe trafficators change to green			
	[Interrupt: Task No.182] Maintain hover			
3 1	190 Move aircraft forward to position abeam ship			
3 6	304 Position with bum lines and correct hover height			
3 8	306 Fly to hauldown hookup position			
3 10	212 Establish high hover	313 Observer trafficators switch to amber		
3 10	315 Observer trafficators switch to amber			
3 10		308 Lower messenger		
		931 3.0 Sec		

Section 1 Approach and Landing
Segment 3 Comms Failure



Time Min/Sec	Flying Pilot	Non-Flying Pilot	Ext In	Ext Out
3 13	316 Observe deck crew moving under helo for hookup	317 Observe deck crew moving under helo for hookup		
3 13	187 Observe trafficators change to green	503 Observe trafficators change to green		
3 14		322 Raise the messenger		
3 14		326 Observe hauldown panel lights cycling – Three green		
3 14	330 Receive "Three Green"	328 Call "Three Green"		
3 14		496 Flash landing gear lights to signal three green		
3 14	332 Call "Three green for constant tension hauldown" to LSO			930
3 14	336 Sense centring force from hauldown			
3 14	338 Centre helo over trap in high hover			
	924 5.0 Sec			
3 14	220 Receive conning instructions	218 Give minor conning instruction		
3 14	324 Observe deck crew moving into hangar			
	941 0.1 Sec	942 0.1 Sec		
3 17	Loop Back to Task Continuous 220	Loop Back to Task Continuous 218		
3 19	222 Transition to low hover			

Section 1 Approach and Landing
Segment 3 Comms Failure


Time
Flying Pilot
Non–Flying Pilot
Ext In
Ext Out
Min/Sec
[Interrupt: Task No.941]
Timer
[Interrupt: Task No.942]
Timer
[Int. Loop to Task 220]
Receive conning instructions
[Int. Loop to Task 218]
Give minor conning instruction
3 24
224 Establish low hover
[Interrupt: Task No.216]
Guard throttles
3 27
226 Maintain low hover
923 5.0 Sec
3 27
228 Receive conning instructions from NFP
230 Give minor conning instruction
3 32
500 Flash landing lights
3 32
232 Call "Ready to Land"
917
3 35
504 Observe trafficators change to green
[Interrupt: Task No.226]
Maintain low hover
3 35
238 Lower aircraft
3 38
498 Observe hand signals from LSO to lower tail probe
506 Observe hand signals from LSO to lower tail probe
3 38
244 Lower tail probe
3 43
246 Confirm light
3 44
502 Observe "thumbs up" signal from LSO indicating tail probe is down
508 Observe "thumbs up" signal from LSO indicating tail probe is down

Section 1 Approach and Landing
Segment 3 Comms Failure

Time	Flying Pilot	Non-Flying Pilot	Ext In	Ext Out
Min/Sec				
3 44	(252) Turn off ASE			

ANNEX H

INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS

ANNEX H - INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS - Part 1

Critical Task Sequence: Landing Sequence - Day Freedeck

Information Required

1 The motion of the ship, wind information, density altitude

2 Helicopter parameters including weight, engine performance, fuel remaining, and preparedness of helicopter to land in terms of pre-landing checks being completed

3 Status of ship for recovery

Retrieval Methods

1 Radio, intercom - Auditory

2 Visual cues including light and other signals

3 Physical gestures from other crewmembers or personnel on ship

Decisions Required

1 Whether the ship is prepared to recover the helo and if the conditions are suitable and within limits to attempt a landing safely

2 Whether the helo and crew are prepared to attempt the landing in a safe and effective manner

3 When to land the helo or whether to Wave off

Information Produced

1 Helicopter and ship operating parameters used to decide if helo is operating within prescribed limits

2

3

Information Management Processes

1 Examining charts, tables and checklists

2 Human communication used to arrive at a decision for landing

3

Information Sources

1 SAC, LSO, crewmembers, visual cues, briefing guides

2 Helicopter instruments

3 Other aircraft or ships

Information Processing

1 Analysing suitability of ship and deck for landing

2 Analysing state of helicopter and crew to perform landing

3 Judging motion of ship and helo while attempting landing

Decisions Making Processes

1 Cognitive processing, verbal discussions with crew and personnel on ship or other aircraft

2 Examining briefing guides, charts and checklists to determine limits and operating parameters

Information Destinations

1 Pilot and crew

2 SAC, LSO, ships Captain

3

Information Transfer Methods

1 Verbal using radio or intercom

2 Physical gestures such as hand signals

3

ANNEX H - INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS - Part 2

Critical Task Sequence: Landing Sequence - Day Freedeck

Situational Awareness Issues

1 The pilot must understand helicopter operating parameters and rules and regulations for flight deck operations

2 The pilot must be able to apply the information gathered to aid in the successful and safe recovery of the helicopter

3

Timing Issues

1 Information on whether to attempt a landing or not must be processed prior to attempting the landing

2

3

Consequences of Error

1 Failure to consider the helicopter operating limits and parameters or the ships condition can result in the loss of the aircraft

2 Failure to assess ships and helos motion accurately while attempting a landing can result in the loss of the aircraft

3

Workload Issues

1 Pilot will be listening and talking on the radios while attempting to conduct a landing sequence

2 Pilots flying abilities may be tested in attempting to land the helo in poor conditions and high ships motion

3

Summary of Findings

1 The pilot must understand helicopter operating parameters and rules and regulations for flight deck operations

2 The pilot must be able to apply the information gathered to aid in the successful and safe recovery of the helicopter

3 The pilot will work closely with the NFP in the final stages of the landing to assess the motion of the ship and the helicopter This is to ensure proper position over the flight deck for landing and help to ensure the safety of the helo

4 Good communication must be had amongst the crew and the personnel on the ship A helicopter recovery cannot be accomplished by the efforts of one person

5 Failure to consider the helicopter operating limits and parameters or the ships condition can result in the loss of the aircraft

6 Failure to assess ships and helos motion accurately while attempting a landing can result in the loss of the aircraft

7

8

9

ANNEX II - INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS - Part 1

Critical Task Sequence: ASE Failure - Troubleshooting

Information Required

1 Status of helicopter systems including electrical system and ASE system

2 Position of ship and readiness for recovery State of helicopter to continue flight, i e Fuel status

3 Level of controllability of the helicopter with no ASE system

Retrieval Methods

1 Auditory using radios and intercom

2 Visual signals from crew and/or personnel on ship

3 Physical sensations provided by helicopter

Decisions Required

1 Where to recover helicopter I e At the ship or go ashore?

2. How to recover helicopter I e Conduct a constant tension hauldown landing

3

Information Produced

1 Briefing on plan and decision on course of action for recovery

2 Information regarding state of helo including controllability, ASE system, and fuel status

3

Information Management Processes

1. Use of checklists in trouble shooting

2 Discussion with crew and ship's personnel to decide on course of action and help with troubleshooting if required

3

Information Sources

1 Helicopter instrumentation and control sensations

2 Crewmembers

3 SAC or LSO on ship

Information Processing

1 Troubleshoot aircraft systems to determine cause of fault and whether fault can be resolved

2 Determine controllability of helo without ASE and assess chance of successful ship recovery

3 Assess alternate recovery locations

Decisions Making Processes

1 Cognitive processing, verbal discussions with crew and ship

2

Information Destinations

1 Crew, SAC, LSO, Ship's Captain, other ships or recovery destinations in the area

2

3

Information Transfer Methods

1 Verbal using radio or intercom

2

3

ANNEX II - INFORMATION FLOW AND COGNITIVE PROCESSING ANALYSIS - Part 2

Critical Task Sequence: ASE Failure - Troubleshooting

Situational Awareness Issues

1 The pilot must know and understand the aircraft systems so as to effectively troubleshoot the problem

2 The pilot must understand the situation with regards to ships position and state of helo for continued flight

3 Pilot must have skill to be able to recover the helicopter on the ship without the ASE if required

Timing Issues

1 The troubleshooting must been done quickly and effectively using the checklist procedures

2 Troubleshooting should be completed before a course of action is decided on for recovery

3

Consequences of Error

1 Aircraft could be lost due to lack of controllability while conducting a recovery on ship

2

3

Workload Issues

1 Pilots workload is intense while attempting to recover the helicopter on ship Lack of stabilization makes landing extremely challenging

2

3

Summary of Findings

1 ASE failure is normally a non critical emergency It is normally considered a Land as Soon as Practicable emergency but this is complicated by having to recover on a ship

2 The pilot and crew must work together to assess the situation, troubleshoot the emergency and decide on the best course of action

3 The ship and it's crew must be prepared to recover the helicopter The ship should come to Emergency Flying Stations to provide the highest level of readiness in case of disaster

4 An ASE off recovery on ship will normally be accomplished via a constant tension hauldown landing This means that the LSO will not vary tension on the way down so as to minimize the effects on helicopter stability

5 Landing a helicopter on a deck in motion with a control malfunction is probably one of the most challenging maneouvres that can be attempted

6

7

8

9

DOCUMENT CONTROL DATA SHEET

1a. PERFORMING AGENCY

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14. ABSTRACT

(U) The Defence and Civil Institute of Environmental Medicine (DCIEM) is exploring various means of providing low-cost, effective training for helicopter aircrew through simulation and virtual environments. Frequently, training requires participation by several individuals; however, coordinating schedules is often difficult. Virtual agents that behave realistically are required to reduce costs and increase opportunities for training.

As part of the ongoing evolution of the process and tools, DCIEM has developed a method for applying the Perceptual Control Theory (PCT) to HFE conceptual-phase analyses. This approach is based on the concept that a hierarchy of goals and control feedback loops can describe both humans and machines. A study completed by BAE SYSTEMS CANADA INC. (BSC) in March 2000 [Reference 2] showed that the PCT approach was applicable to HFE conceptual-phase analyses and offered some benefits over the traditional MIL-HDBK-46855 approach. Based on the findings of this study, DCIEM is proceeding with the further development of PCT elements within the Integrated Performance Modelling Environment (IPME).

This effort created a model of Sea King helicopter crew behaviour within IPME using a PCT-based analysis. As part of the model development, gross and critical goal analyses, and an information flow and cognitive processing analysis were conducted. Additionally, traditional OSDs, developed using the SOLE toolset, were prepared. To support DCIEM's effort to integrate IPME with anthropometric analysis tools such as Safework™, data describing the physical elements of pilot goals, e.g. control actuation or general body movement, was captured and incorporated into the model.

The results of this analysis illustrate that IPME can be effectively used to conduct a PCT analysis of an operational domain. Additionally, this project demonstrated that the data necessary to animate anthropometric mannequins could be incorporated into a network model, with the potential to be linked to other HFE analysis simulations such as Safework™. Unfortunately, the present state of the HFE toolsets requires that the same data be handled multiple times, e.g. network models were generated in Visio and SOLE to allow SME review but were then manually recreated within IPME to allow network simulation. It is recommended that the evolution of IPME and other HFE tools be supported to yield one integrated tool.

It is anticipated that the IPME model will be used in the future development of a pilot-agent that can be used in distributed network simulation as a deck landing and take-off training aid for other crewmembers. Eventually, a pilot model that can interact with other networked models, virtual agents, and human participants in distributed simulations (most likely through HLA) will be developed.

15. KEYWORDS, DESCRIPTORS or IDENTIFIERS

(U) Human Factors Engineering; helicopter deck landing; modelling; aviation; IPME; system analysis

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